DECEMBER 1969

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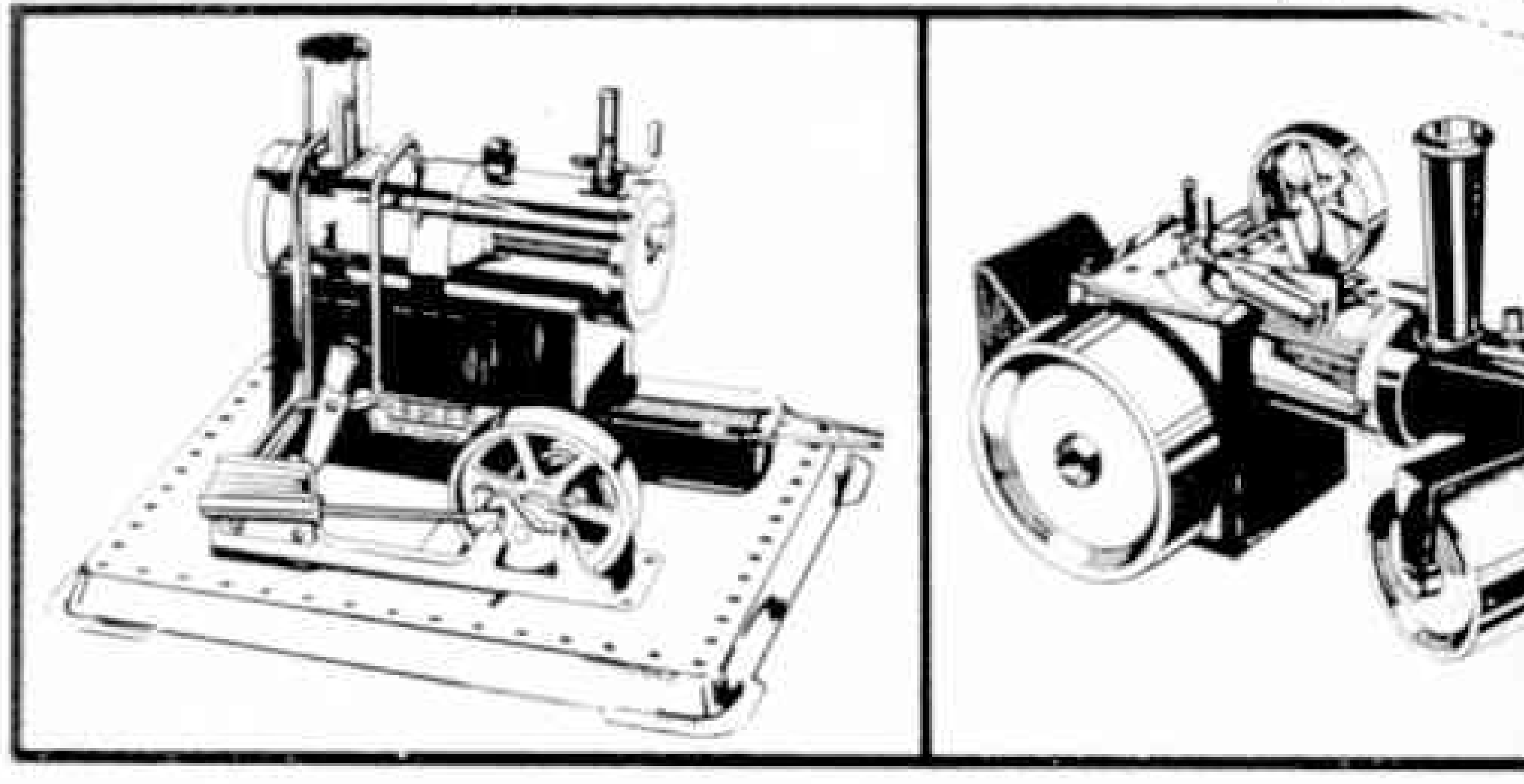

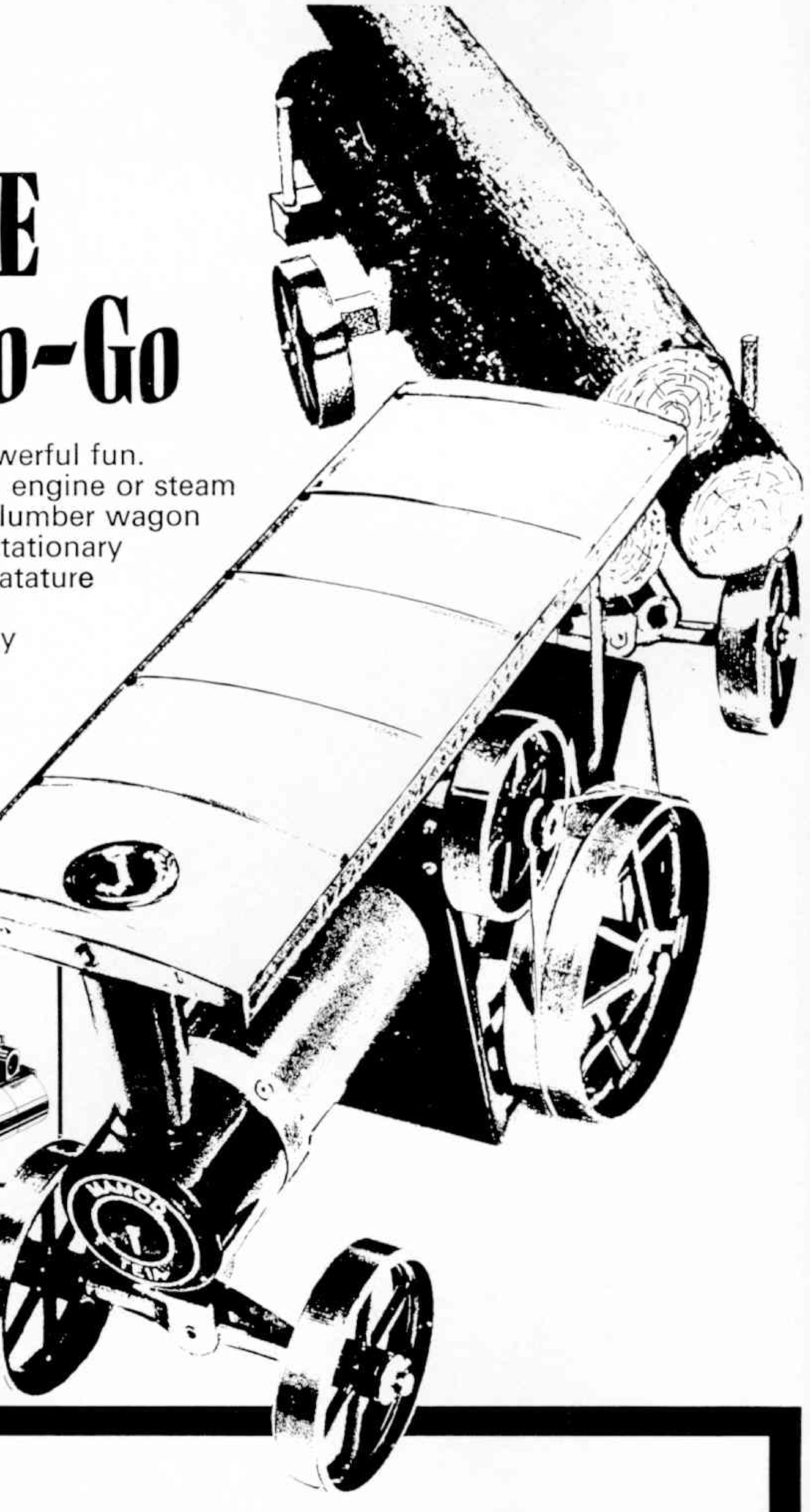

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MECCANO® Magazine

DECEMBER 1969 VOLUME 54 NUMBER 12
Meccano Magazine, founded 1916.

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MAP **HOBBY MAGAZINE**

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FRONT COVER

Swinging silently above the Austrian Alps, the Solden cable-car holds up to 45 people, reaching a height of 4,435 metres above sea level. Upon reaching the top, passengers have a breathtakingly beautiful view of the inner Oetztal Alps. *Photographed by Raymond Canham.*

NEXT MONTH

Although our January issue, next month's Meccano Magazine comes out well before Christmas, and we thought this would be an ideal time to show readers some of the latest toys and games on the market. Although mainly included in our regular "Have You Seen" column, items which we consider to be worthy of special note will be reviewed in detail elsewhere in the issue, and will include a fantastic new Horse-Racing game from Tri-ang.

In this first issue of the New Year, Charles Rigby, popular science writer for the magazine, will present a feature on four men who lived under the sea, for 60 days, entitle "Tektite I. Undersea Research Project."

Our popular series "On Two Wheels" will describe and illustrate the new high performance Lambretta "Grand Prix" motor scooter, remarkable machine with shattering performance.

For Meccano enthusiasts "Spanner" describes a variety of models for both beginners and advanced builders, some of which are as follows: For advanced modellers a Live Steam Tractor; for intermediate modellers a Gantry Crane; and for the youngsters a working Horse and Cart.

Also under the Meccano banner, Bert Love starts off with the first of his new series on gadgets and mechanisms.

All the regular favourites are included, to round off a bumper issue with which to start the New Year.

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Publishers of Aeromodeller, Model Boats, Model Cars, Model Engineer, Radio Control Models, Model Railway News.

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MODEL & ALLIED PUBLICATIONS LTD.
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model engineer exhibition 1969·70

31 December '69—10 January '70 ★
Seymour Hall, London, W.1

SEE AND ENJOY

There will be a magnificent collection of models of all sorts shapes and sizes covering locomotives, traction engines, steam rollers, ships, yachts, cars, aircraft, in fact anything which can be modelled. These entries will be competing for a wide selection of trophies, cups and other awards as individual entries, in addition this year the emphasis will be very much on the club aspect and not only the governing bodies but some of the larger individual clubs have come together to give a composite exhibit of their efforts.

In the gallery, the popular " Boys' Exhibition " organised by Commander Guffick will be there again—bigger and better. There will be a Meccano Competition and a fine display.

WORKING MODELS

The ever popular live steam exhibit will be operated by the Society of Model and Experimental Engineers and youngsters of all ages, five to seventy, will be able to have a ride behind the steam engine. The S.M.E.E.'s own stand will also, of course, have its usual selection of models operating under compressed air.

COME AND HAVE A RUN

. . Yes, you can now with your locomotive. If it is an LBSC prototype then enter the LBSC MEMORIAL BOWL CONTEST which requires a track run. A second track will be in operation this year with 2½ (yes, 2½ !) in. gauge, 3½ and 5 in. facilities. We are open to accept visits from clubs bringing their locomotives to " put on a show " during the exhibition. Limited time available so make up a party and get a firm date.

HISTORIC MODEL AIRCRAFT COLLECTION

Lt.-Commdr. Greenhalgh's collection of famous model aircraft and power units from the birth of flying to the present day will be on display.

POND FOR LITTLE SHIPS

(about 2 ft. l.o.a. is the limit) where radio-controlled boats will be demonstrated. Why not arrange to bring yours ?

MECCANO DISPLAY

In addition to a Meccano Model Class there will be a fascinating array of working Meccano models, including the famous Ferris Wheel (from Vienna's Prater—Remember " The Third Man " ?)

ECRA CAR CIRCUIT

(as built for National Championships). All day running, individual, club, inter-club competitions and visitors' races. Both 1/24 and 1/32 scales operating; six-lane track. Prizes for novices and expert alike. Send for detailed day-by-day programme.

WORKSHOP EQUIPMENT

Tools to make things. Lathe accessories, complete lathes, small tools and the like make a strong and popular class. Smaller items will be displayed safely under glass.

CLOCKS

Horological work is one of the most rewarding of home workshop efforts. In recent years we have had excellent support from enthusiasts.

RADIO CONTROLLED CARS in action. An operating area round the pond will be used by electric r/c cars. If you have one bring it along!

STAMP COLLECTORS

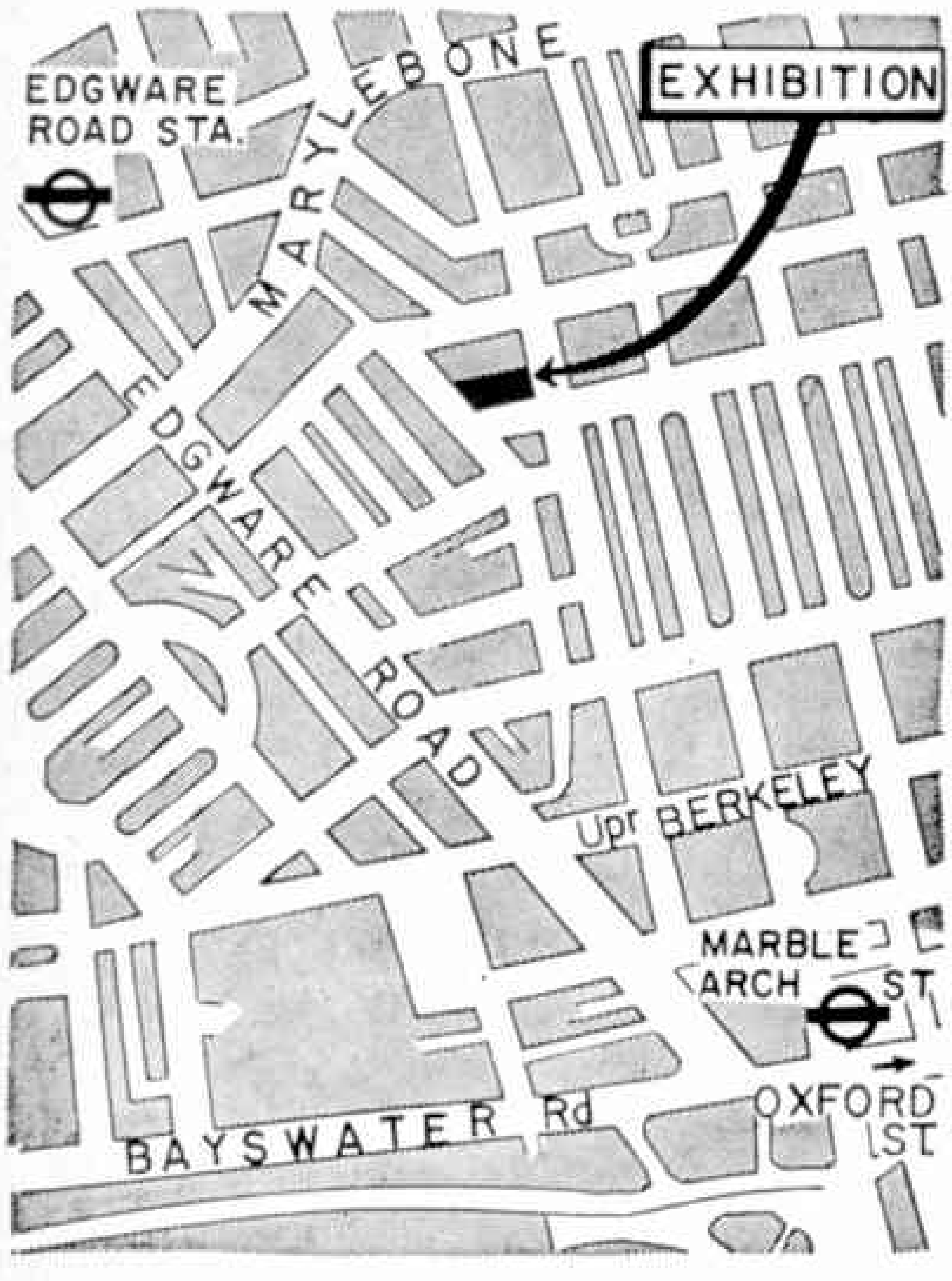
Specially franked covers and other items of philatelic interest will be available. A commemorative cover will be available and may be posted from the Exhibition with a special frank.

MODEL TRADE SUPPORT

Once again we welcome members of the model trade who will be displaying their wares and in most cases selling their products. We have Beatties of London, Kennions, Myfords, Traction Engine Enterprises, Historex, Flying Dutchman, Mainstream Productions, Howard Taylor, Arms & Armour Press, Sartglen Eng., Arlington Supplies, Cromar White, Turntable and G.R.P. Marine. In fact there should be somebody to please the enthusiast in every angle of model making. Our own M.A.P. books will be on sale and a number of representative model governing bodies will be exhibiting, including The Society of Model and Experimental Engineers, Society of Model Aeronautical Engineers, International Plastic Model Society, Model Power Boat Association, all of which are National Non-territorial bodies. In addition there will be a number of club features to show what can be done.

SOUVENIR GUIDE

A very special Christmas Extra issue of Model Engineer will be coming out on December 12th. This will be the Exhibition Souvenir Handbook and Guide. It will contain Exhibition Entries, details of Stands, plus articles by experts on all aspects of modelling. On sale everywhere and at the Show. If you cannot come get a copy and it should persuade you. If you expect to come read all about it first.



PARTIES

Many clubs will be organising parties to come. We shall be very happy to welcome them, give them reduced price bookings, also book up party lunches, teas or other meals well in advance. **Single and small number pre-booking tickets are available from these offices at Adult 3s. and Child 2s. Parties of more than ten: Adults 2s. 6d., Child 1s. 6d. Admission at the Pay-box is: Adults 4s., Child 2s. 6d. Any youngster at school is a child. Under five, admission free accompanied by an adult.**

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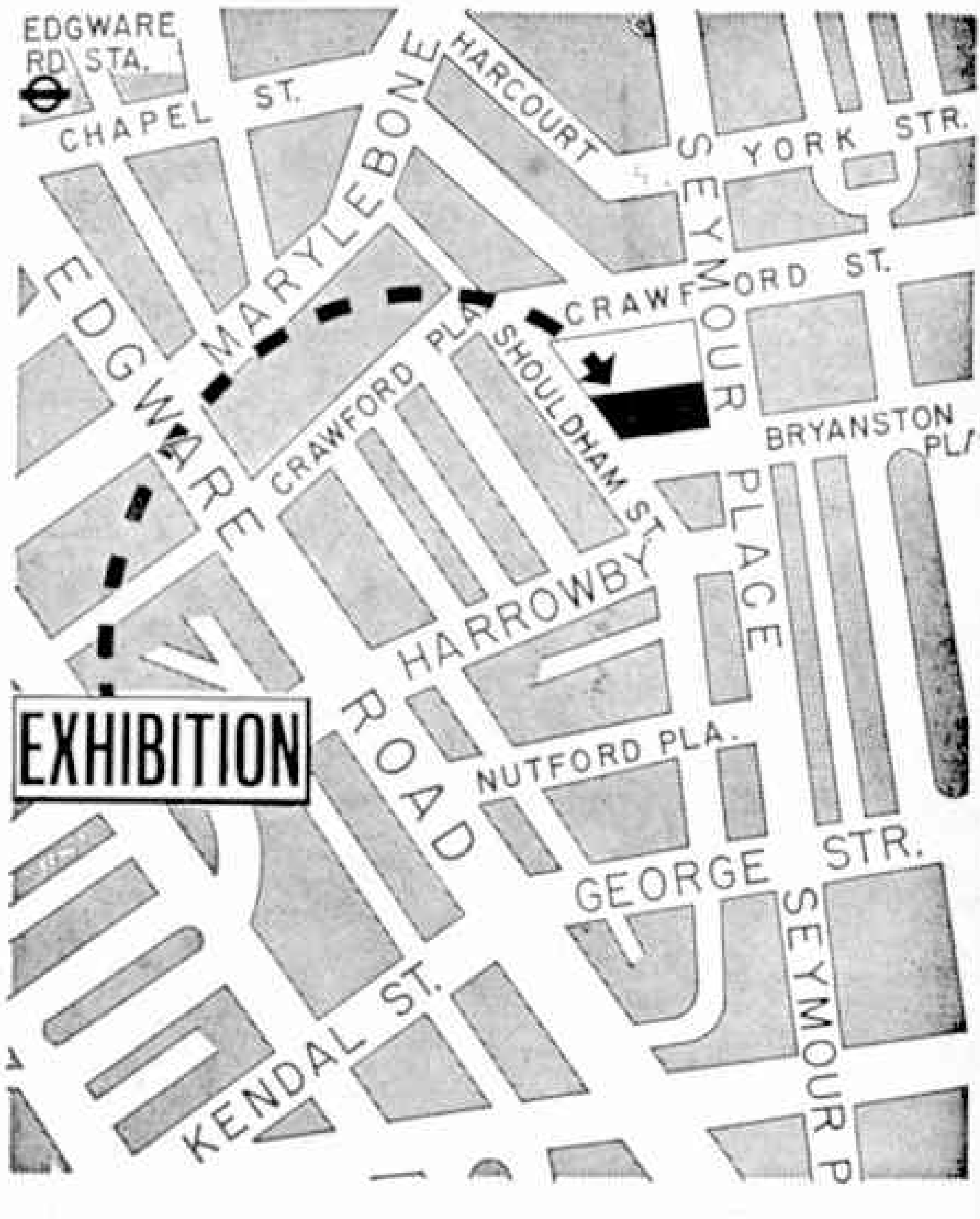
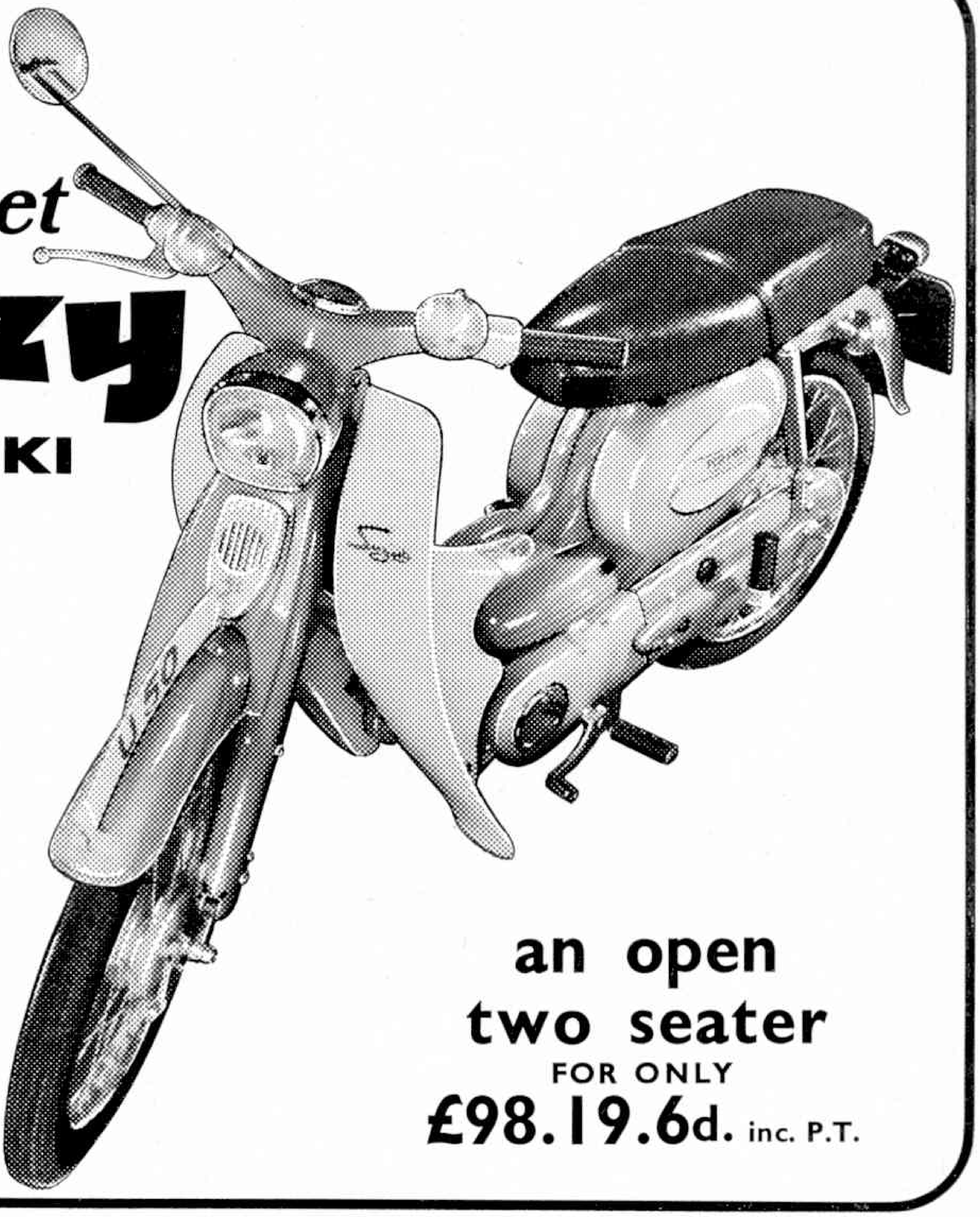


Sweet Suzy

SUZUKI



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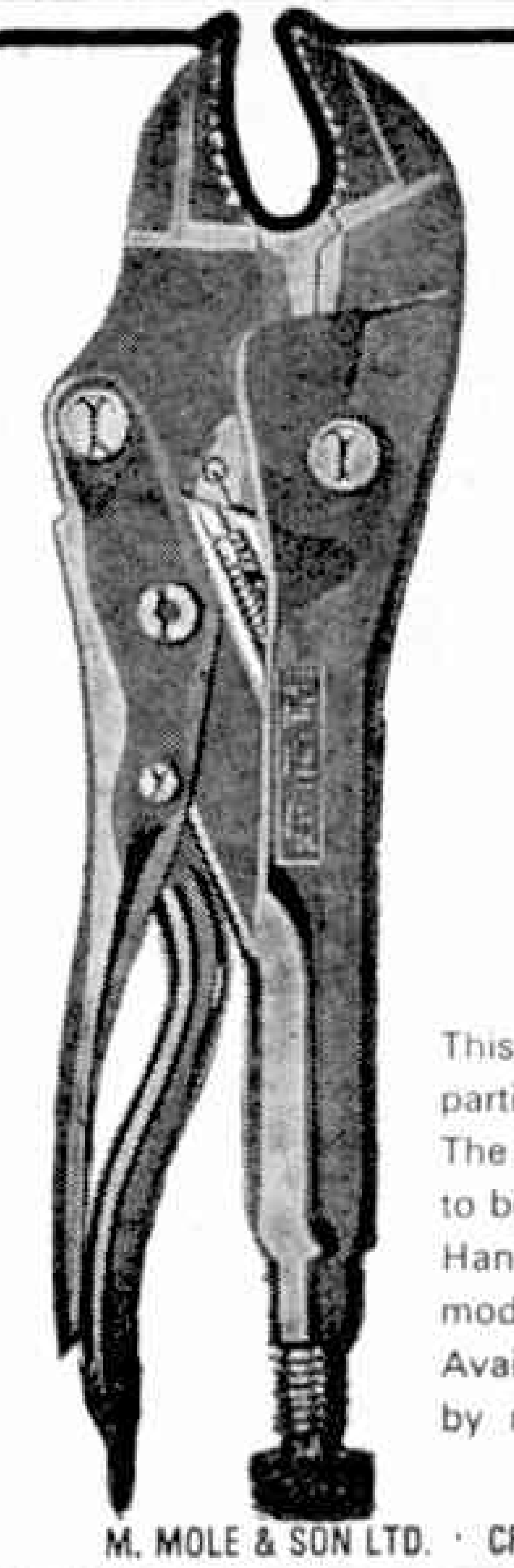

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All that is necessary for you to do to obtain the benefits of this magnificent cover is to complete the forms at the right of this announcement, sending the first part to us together with your remittance of 5/-, which covers you for one year, and handing the second part to your usual magazine supplier. Whenever or not you already have an order in hand for the regular supply of your magazine, this form should still be handed in and your dealer will adjust his requirements according to whether you are a new customer or merely continuing your old arrangement.

This insurance is the prudent thing for every modeller to take out, but it is a sad fact that until now, although the governing bodies of the hobby have offered this cover to their members, something like 90 per cent of the modellers in the U.K. have never taken up this opportunity and are operating 'without insurance protection'. By joining M.A.P. 'Modellers' Accident Protection' you come into the world's BIGGEST MODEL CLUB. For your initial subscription you obtain a lapel badge for identification and transfers to put on your model.

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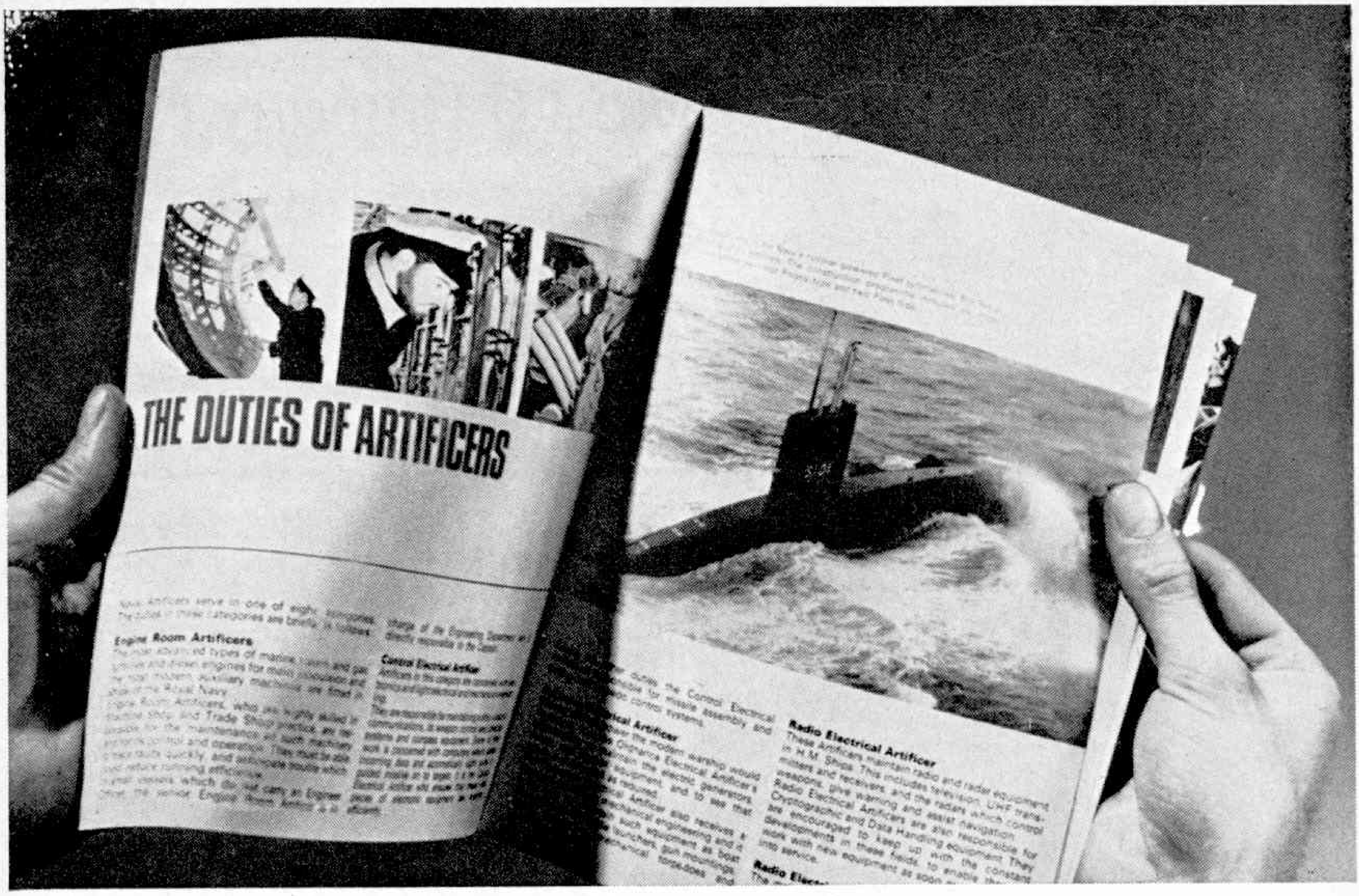

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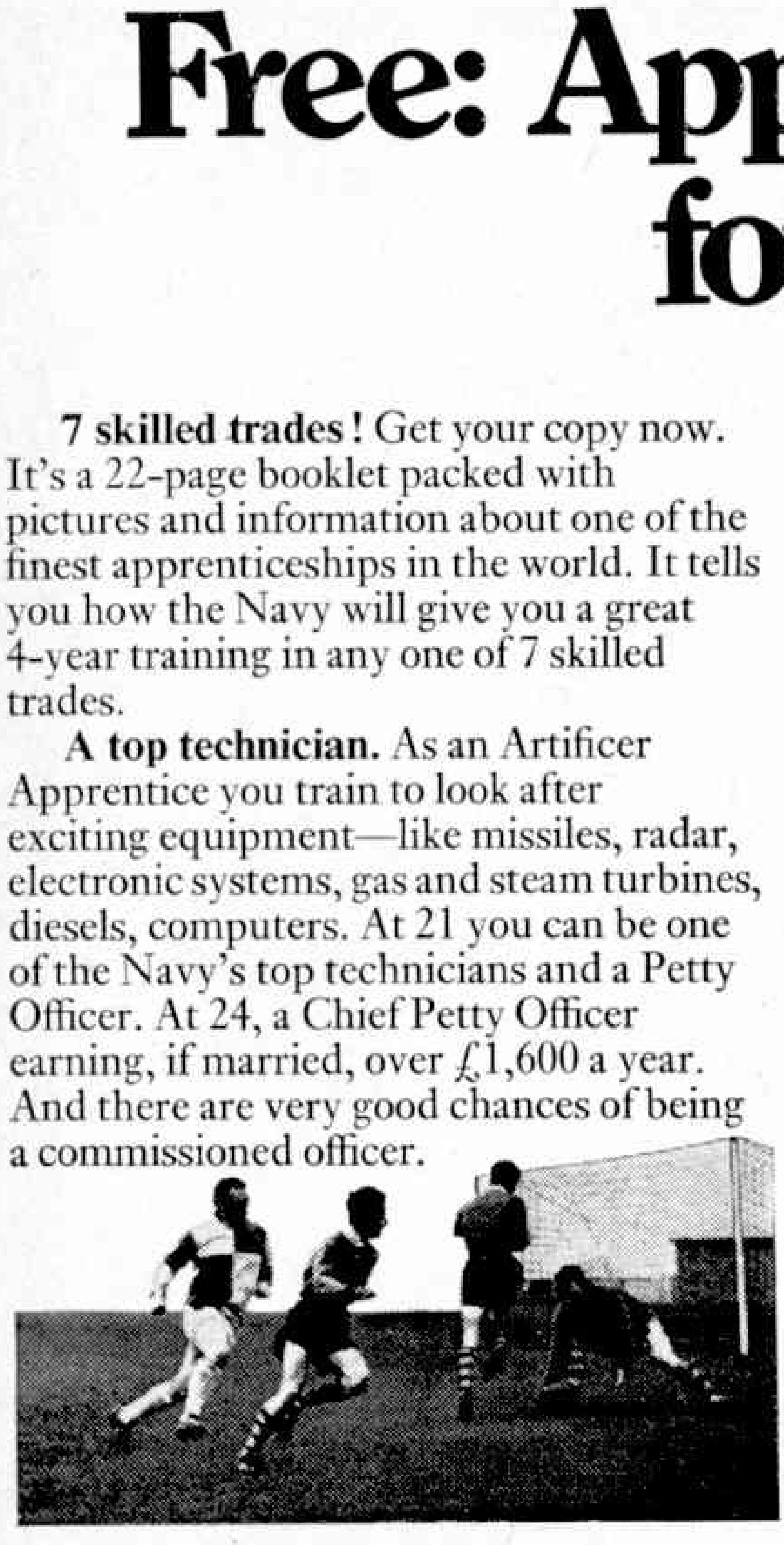

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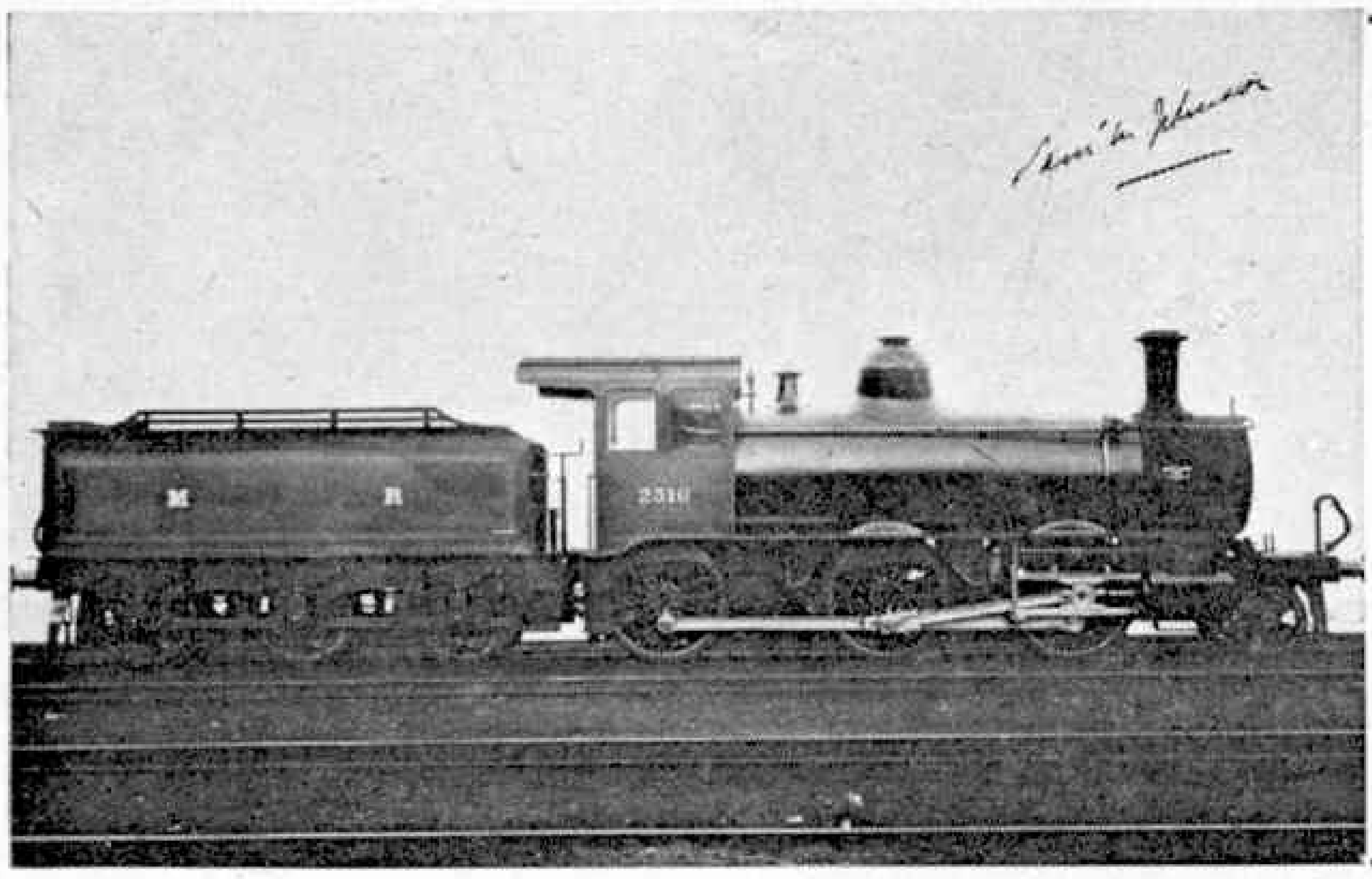
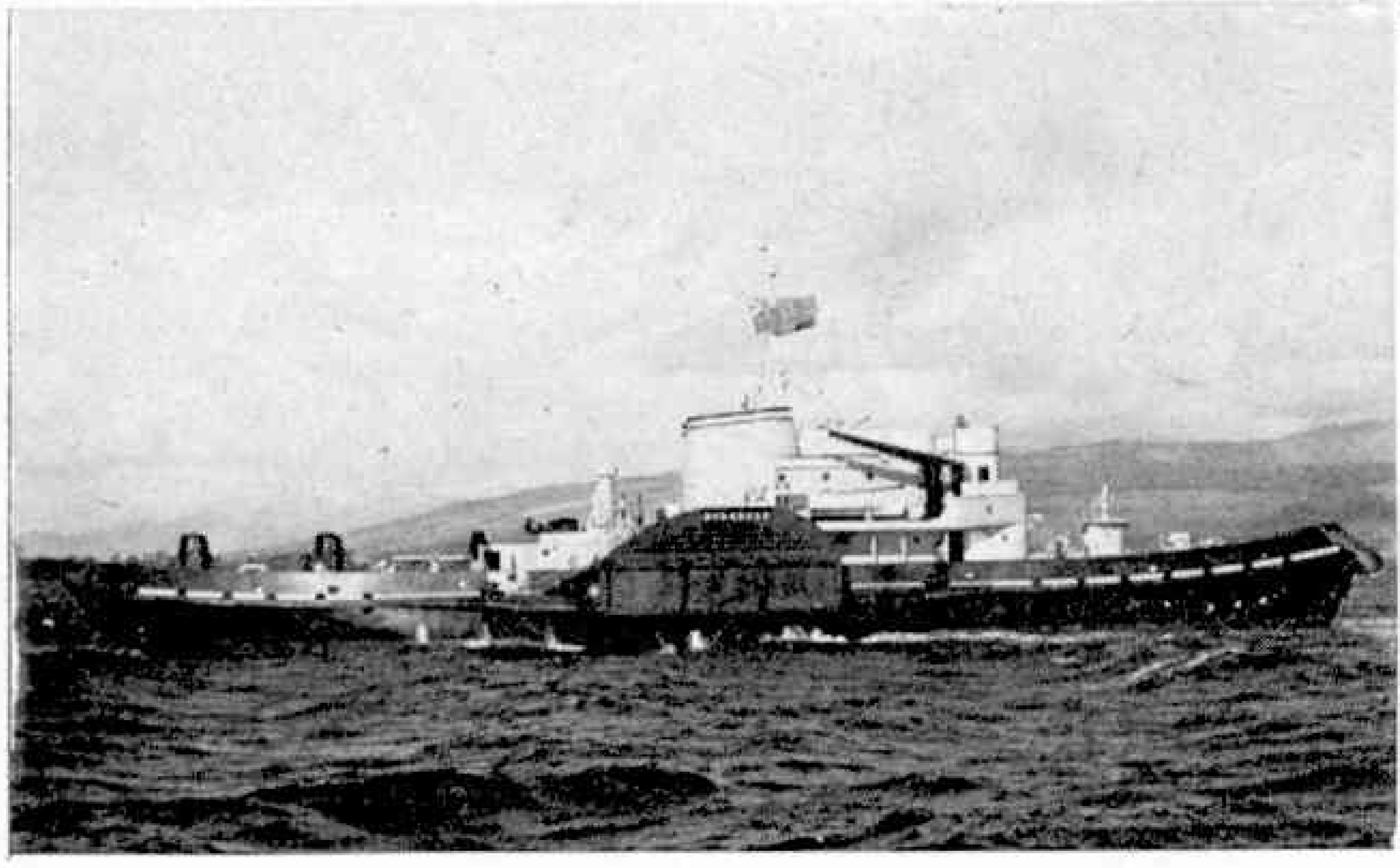


Model Railway News

The 60-page December issue includes an article on the American built locomotives for the Midland Railway, by D. A. Bell; more low relief modelling from Giles Barnabe (this time three shops); Mirfield locomotive shed, L. & Y. by Martin Waters; 21 years of Railway Modelling, a retrospective account by Smokey Bourne; a Lone Star OOO gauge layout; a special feature on yard cranes by Michael Andress, plus all the usual features including Light Railway Modelling, Wagons of the Private Traders, and Talking Shop.



Model Boats/Dec.

on sale 28 November, Price 3s.

Increased size (additional pages) and a free full-size plan for a 32 in. model corvette are features of December's *Model Boats*. The corvette is electric-powered and suitable for radio control. Other features include the 1969 10-rater Champion *Stroller*, an Admiralty paddle tug, an electronic horn for models, how to build a waterline model of *Queen Elizabeth 2*, and much else besides. A bumper number—make sure of it !

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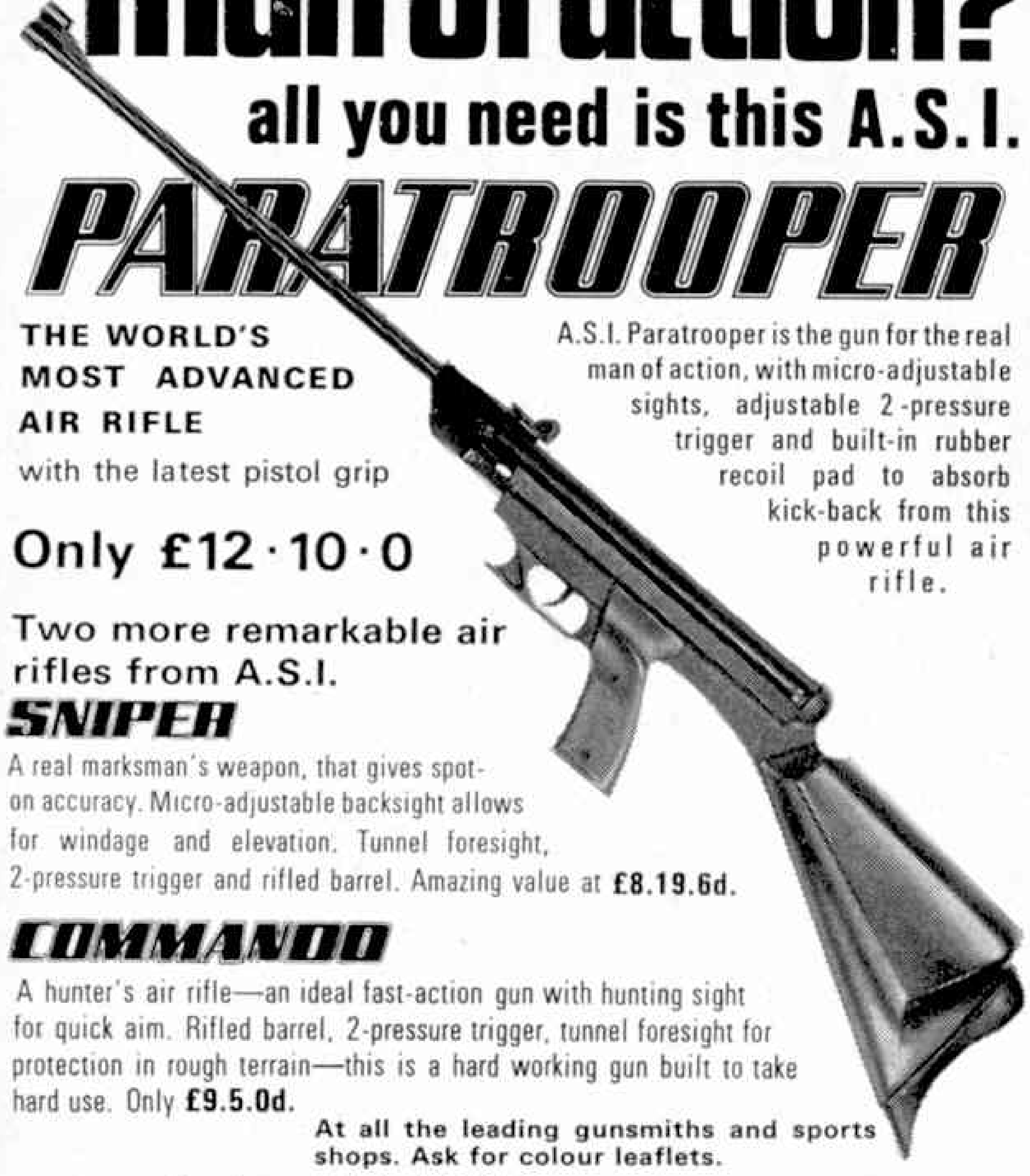

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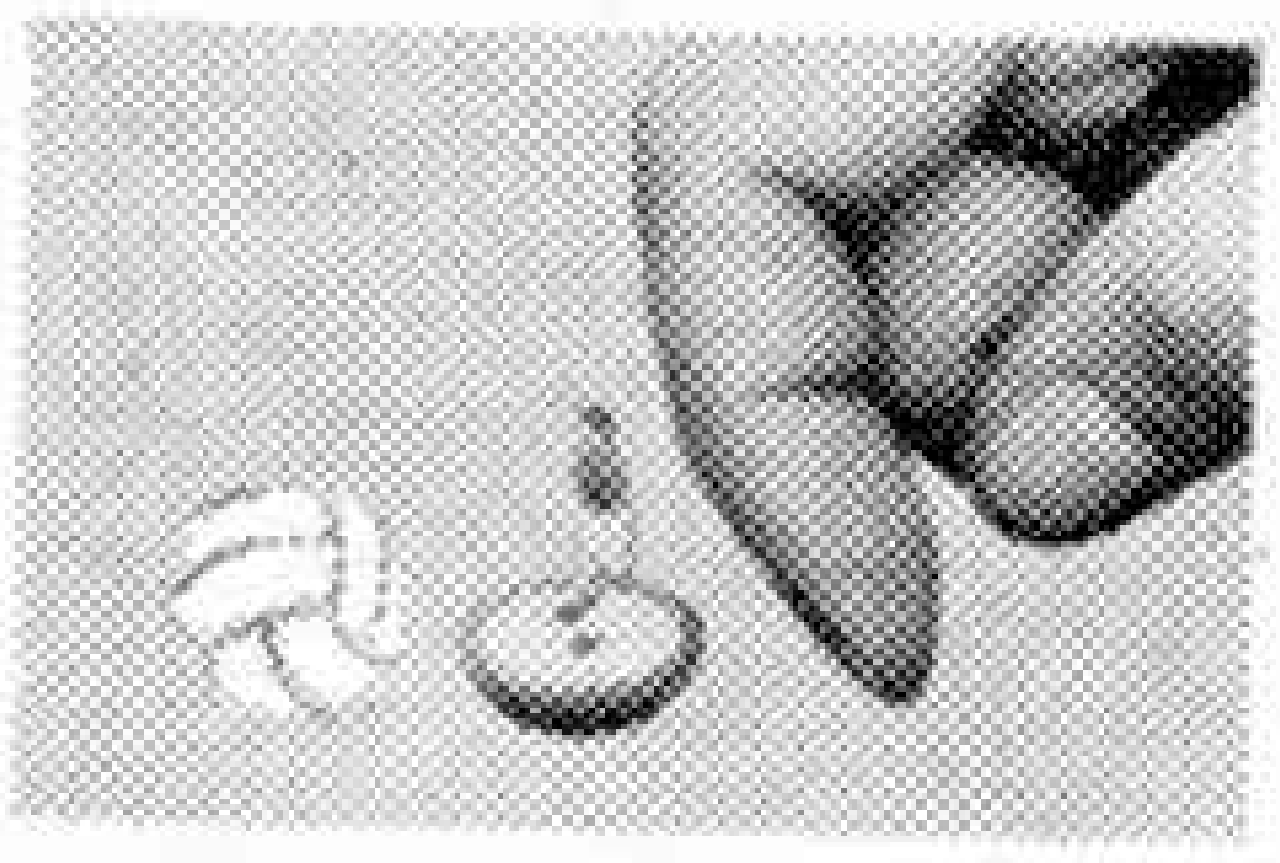

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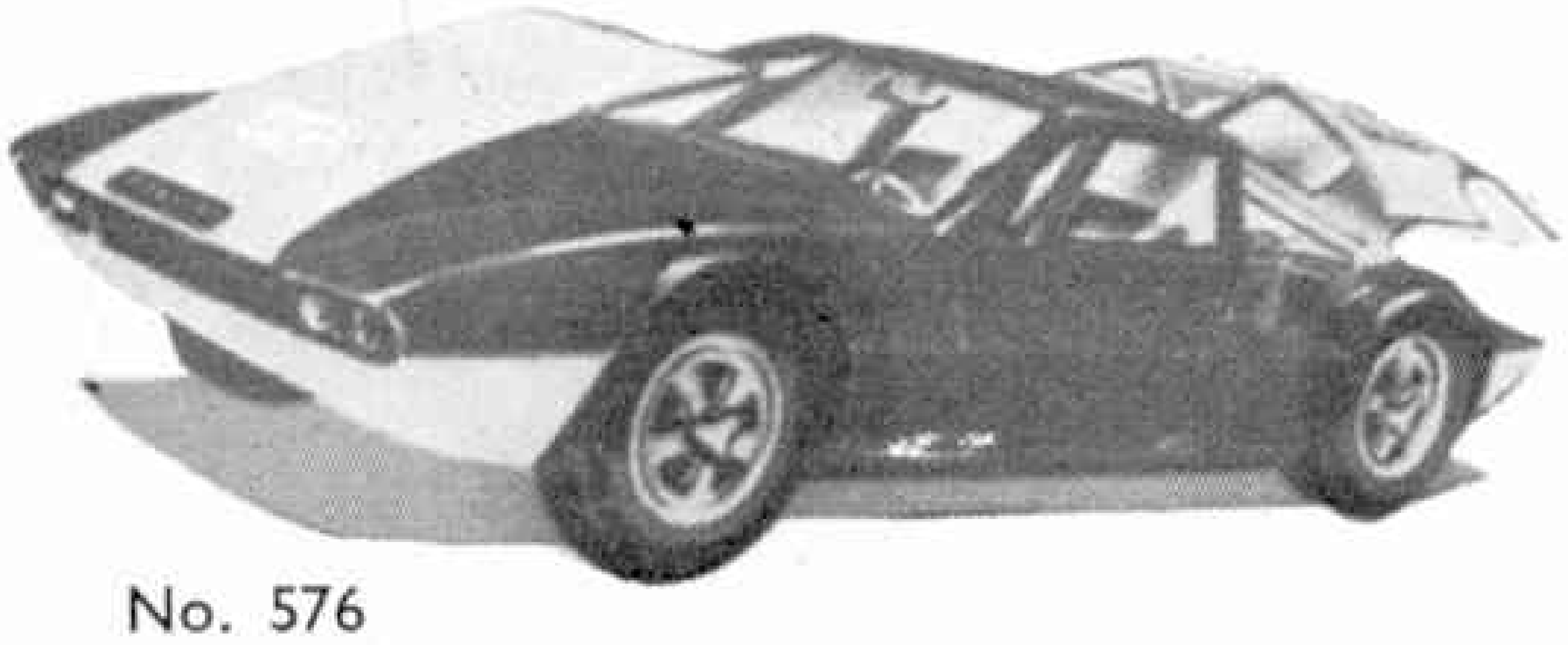

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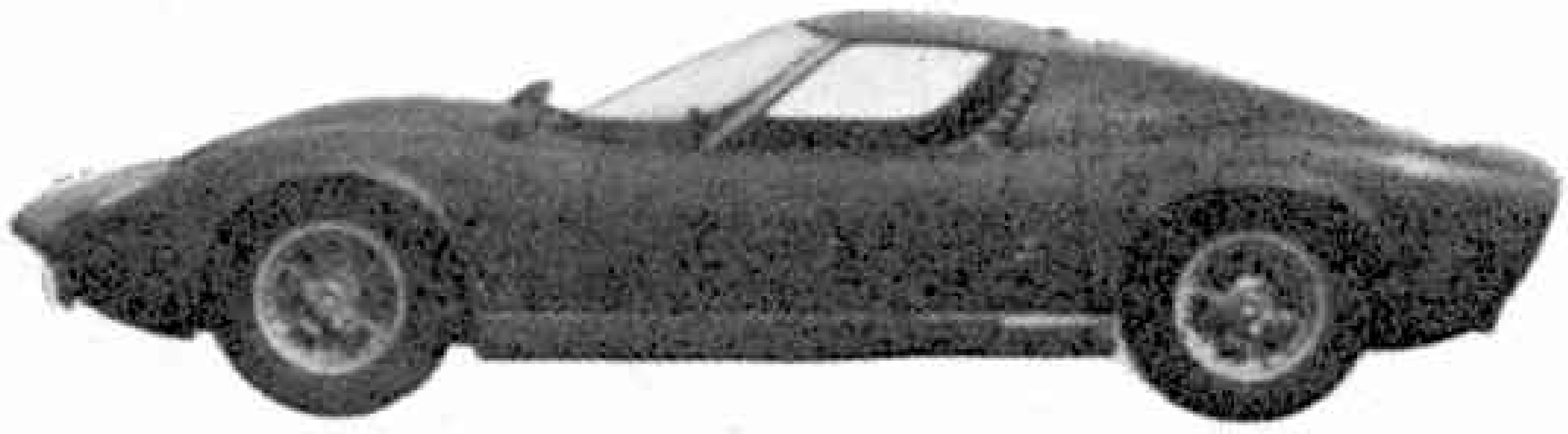

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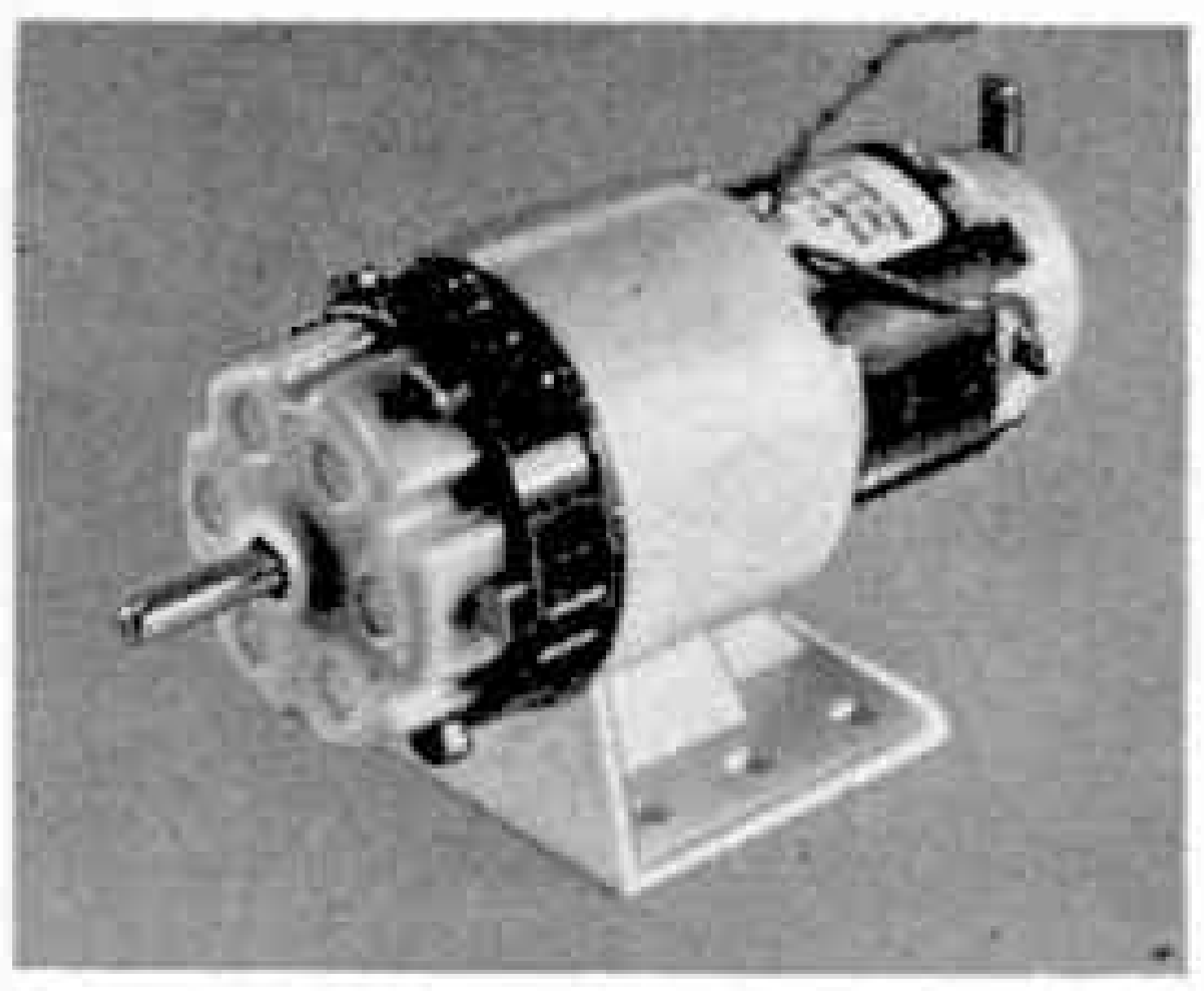

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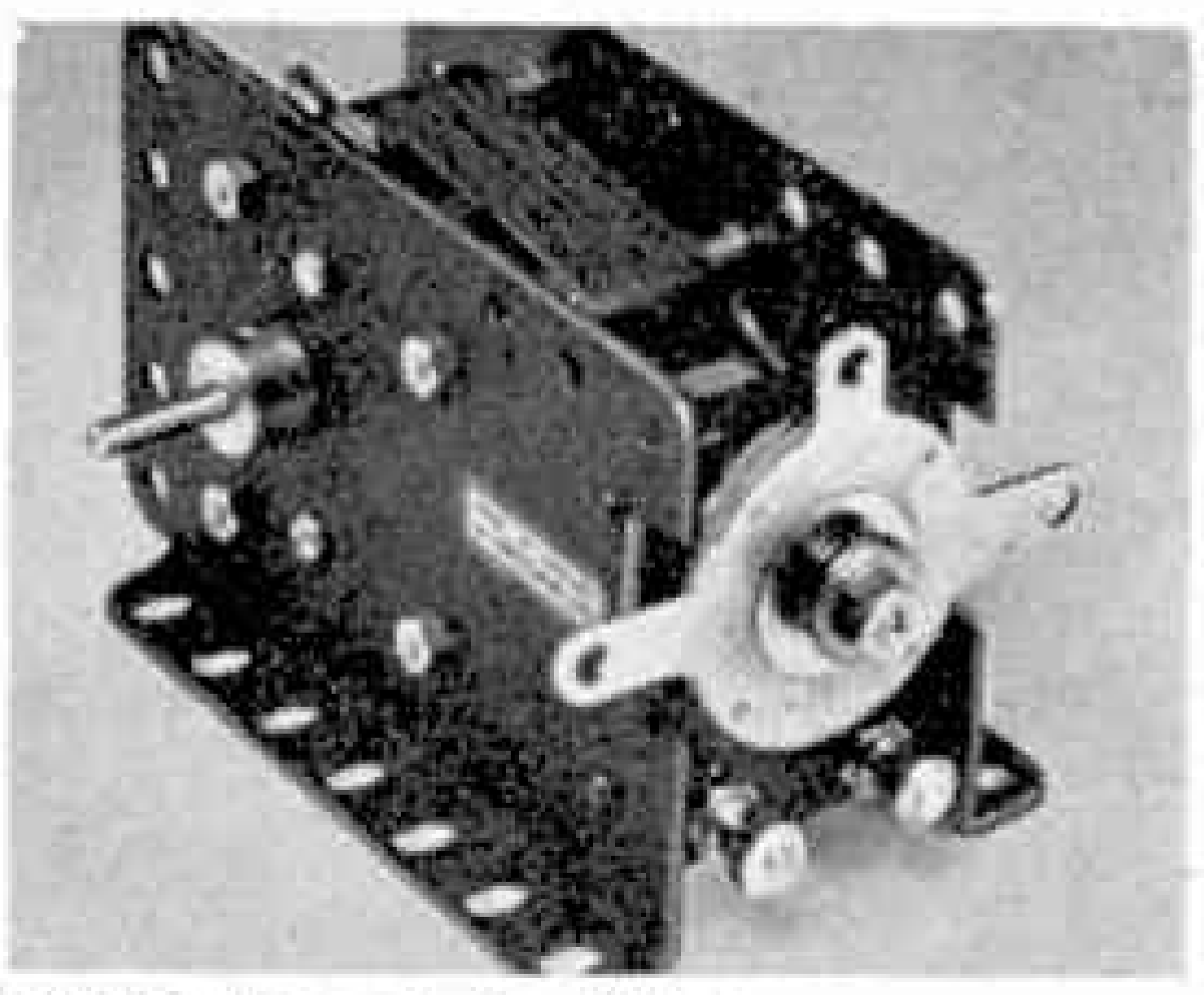
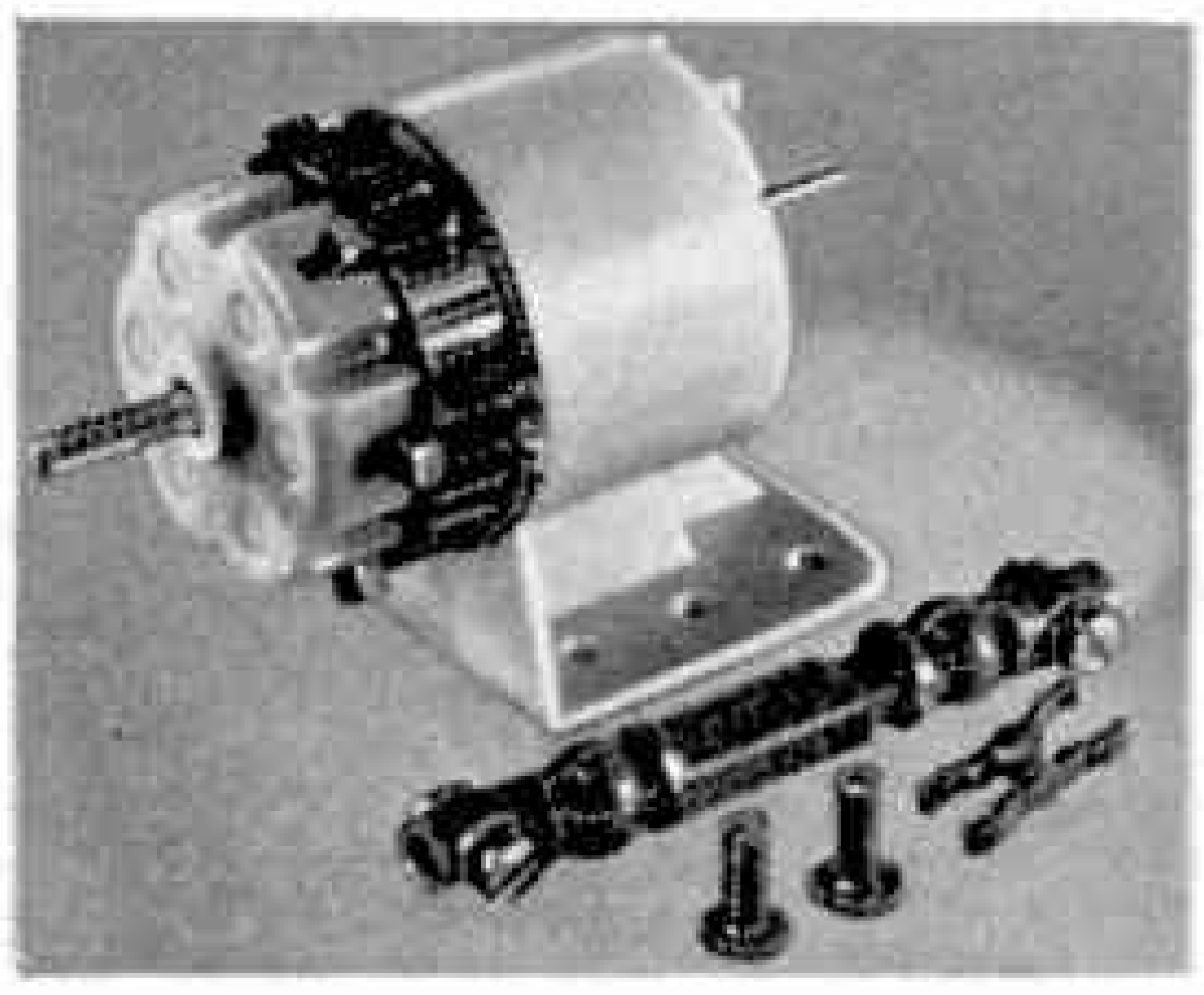
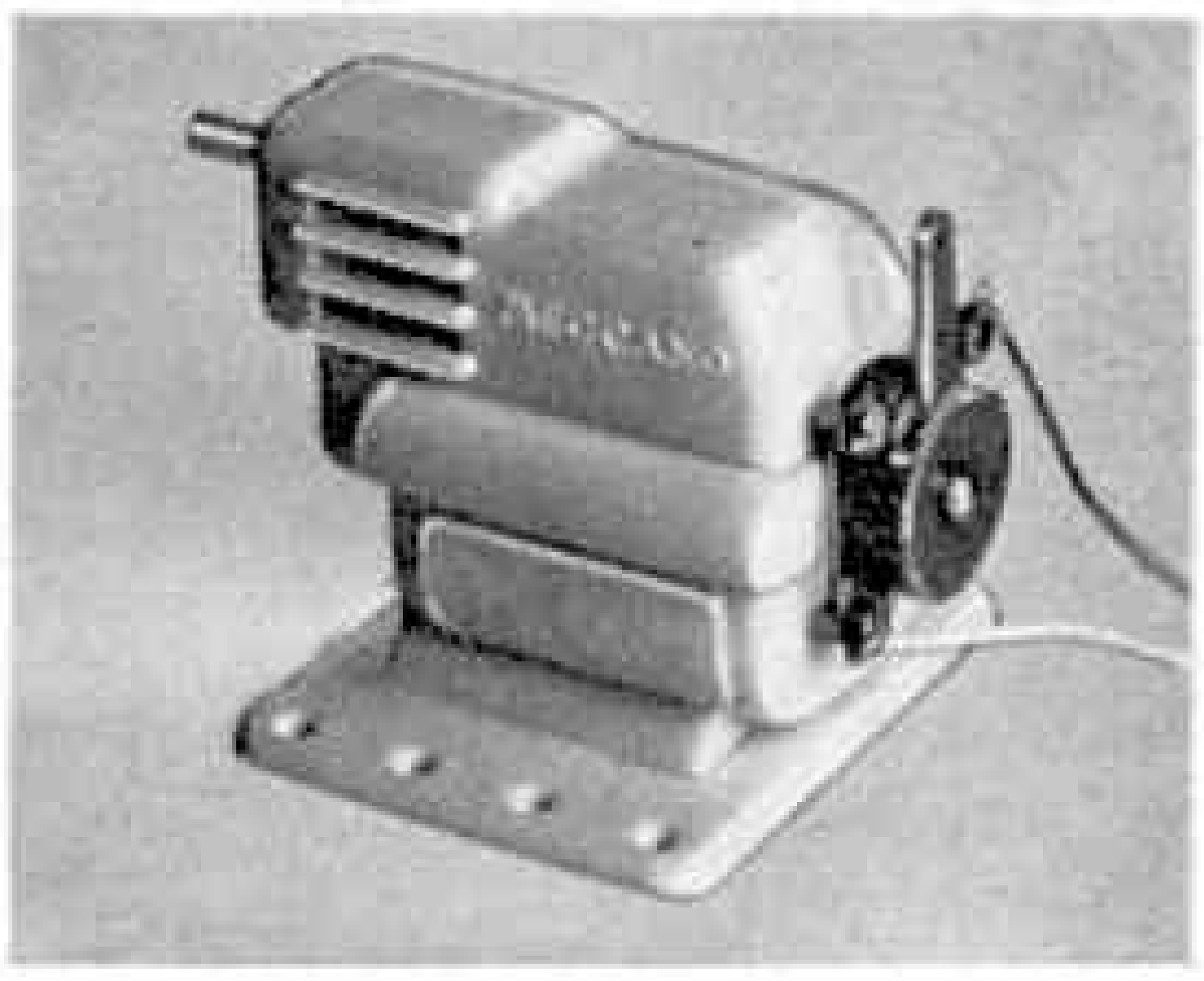


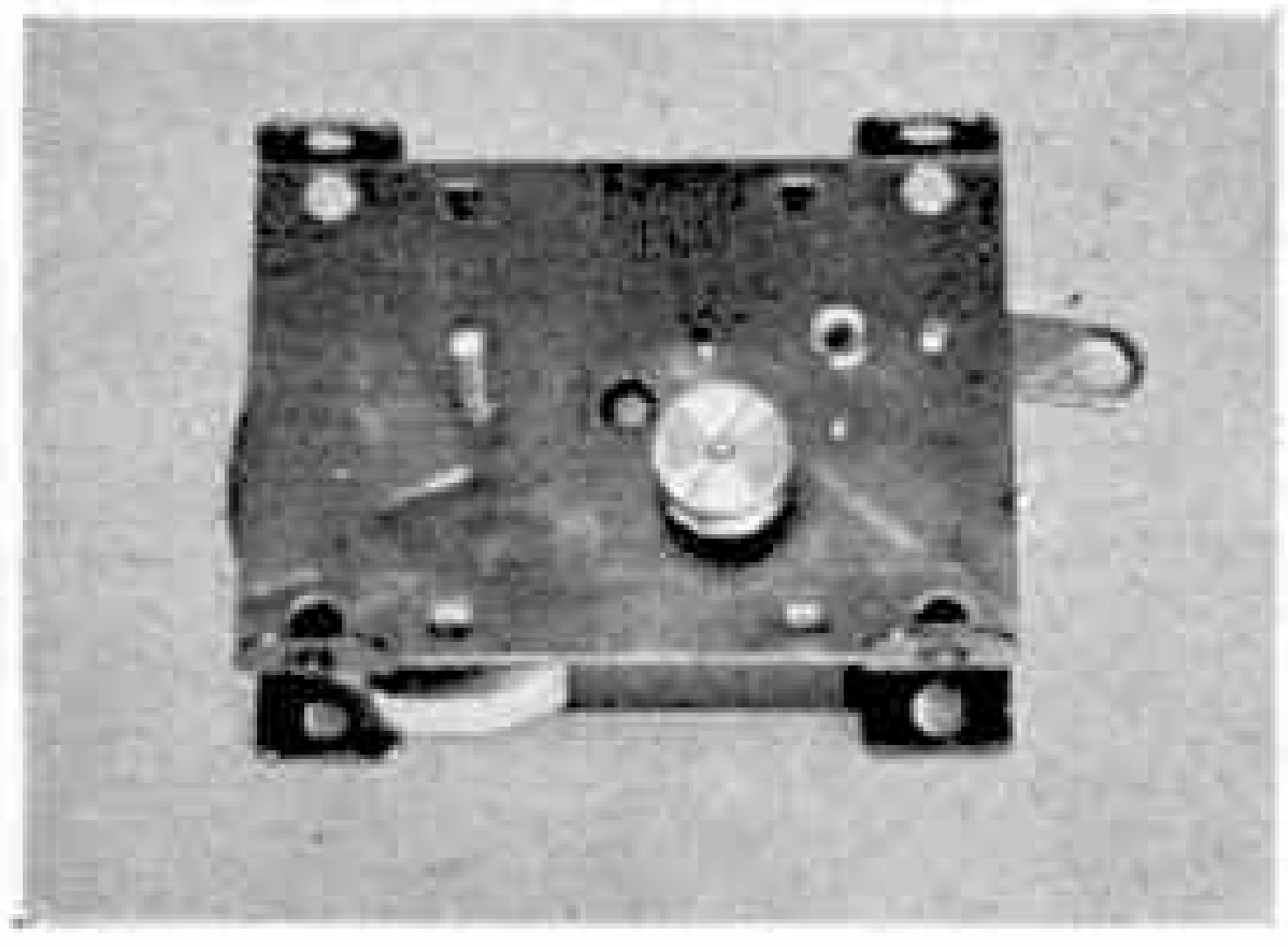
E15R Electric Motor 12/15 volt motor with built-in reversing switch. Will operate through transformer or give adequate power when run from suitable batteries. **£3.9.11.**



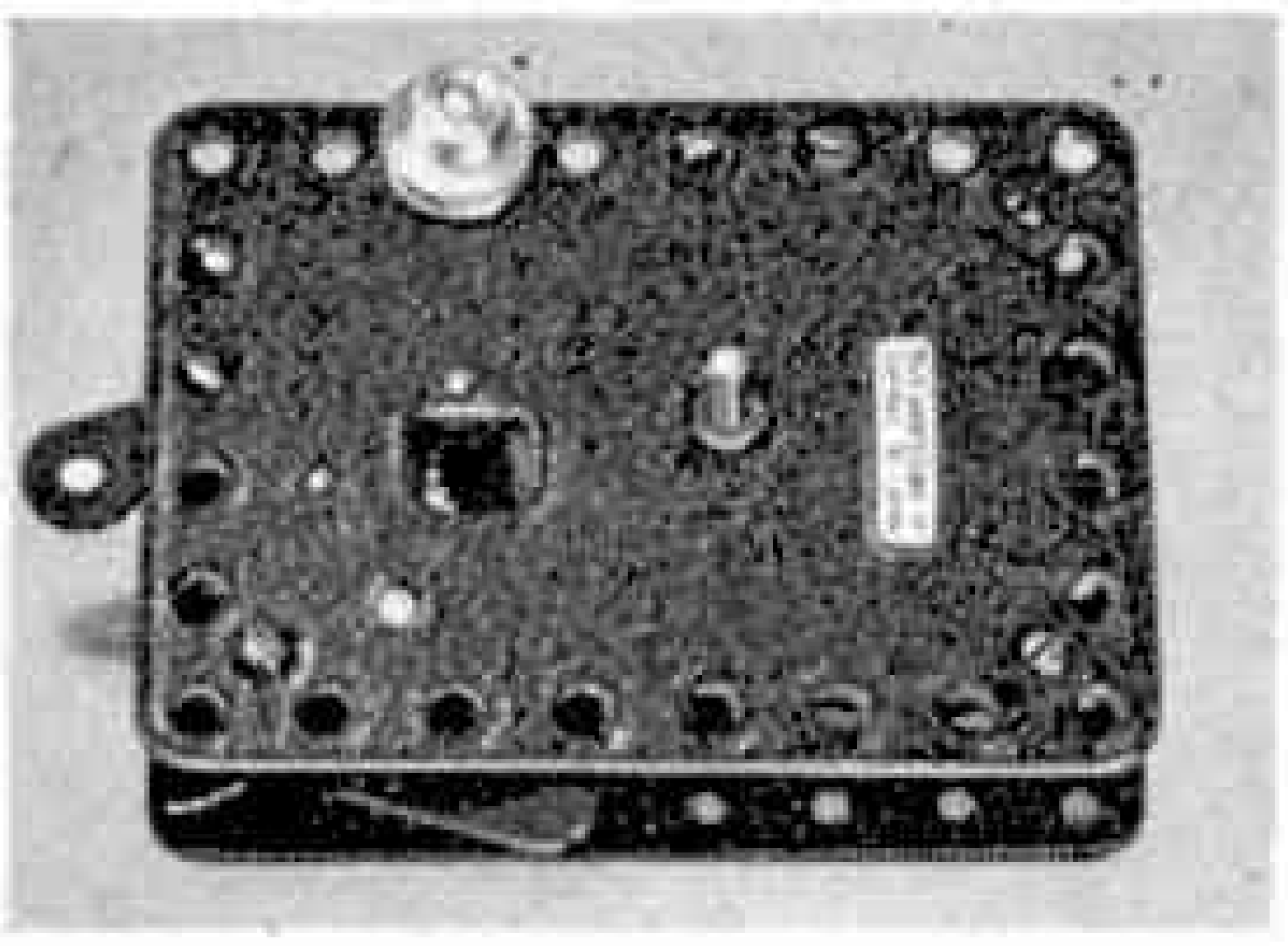
Power Drive 6-Ratio Gearbox with universal coupling Transmission ratios 3:1, 6:1, 12:1, 16:1, 32:1, 60:1. Can be coupled to any motor or other driving source that uses a 5/32" diameter spindle (Standard Meccano Rod size). **£1.16.11.**



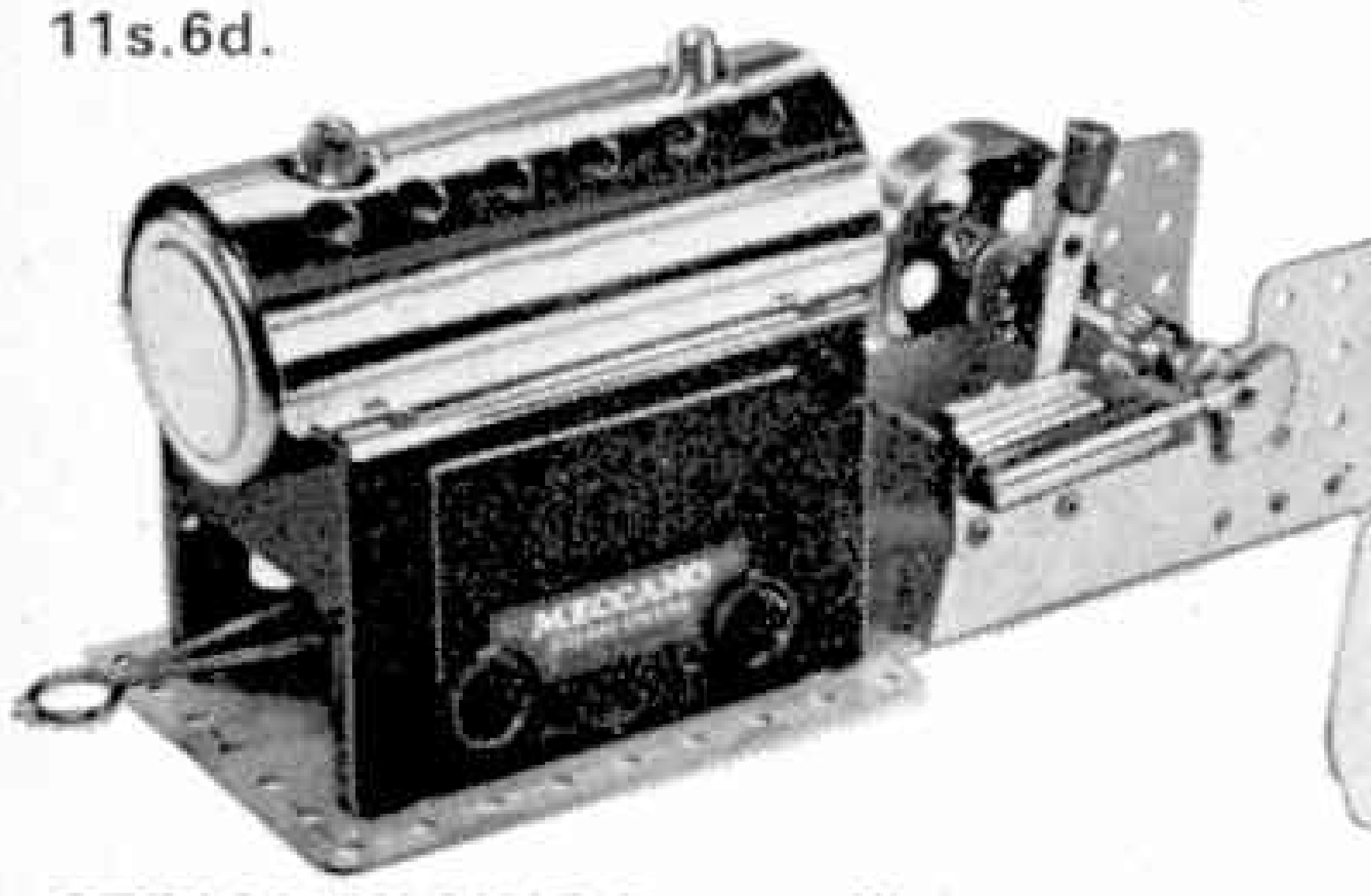
Power Drive 4½ v. D.C. Reversible Motor This Motor will run from Direct Current of 4½ volts, which may be supplied by a battery such as types 1289, F40 or equivalent. It has a stop, forward and reverse lever. **£1.6.11**



Magic Motor Non-reversible clockwork motor, specially intended for driving many of the smaller Meccano models. **11s.6d.**



No. 1 Clockwork Motor Fitted with reversing mechanism — suitable for driving many of the larger models. **£1.12.6.**

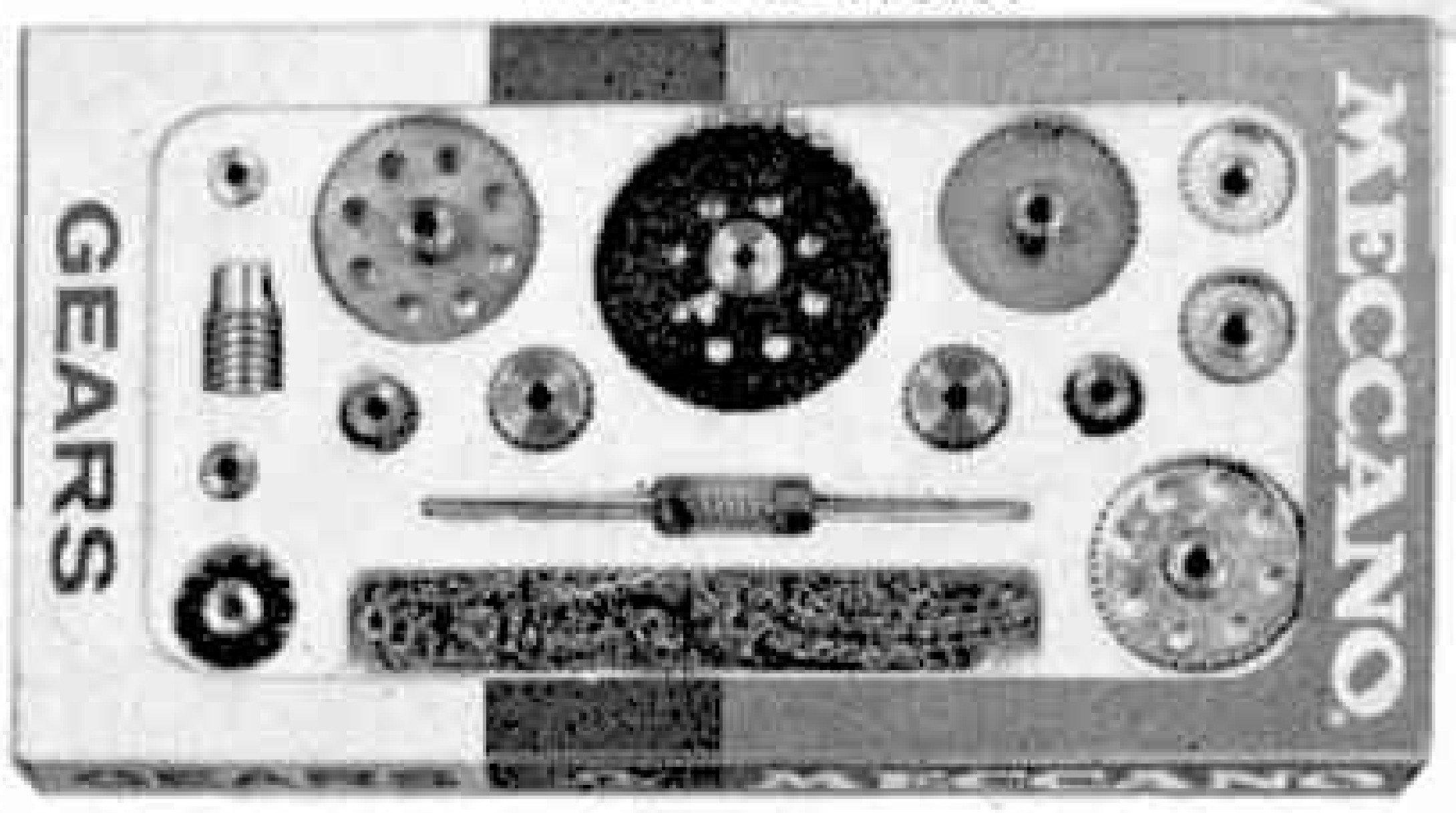


STEAM ENGINE Super-efficient power to drive off gears, chains and pulleys. Works on water heated by methylated spirits burner. Operating reversing lever. **£3.15.0.**

Super Sets to add new scope to Meccano

MECHANISMS SET
All the parts and instructions needed for making clutches, differentials, disc brakes, free wheels and all sorts of useful mechanisms.
£2.5.0.

ELEKTRIKIT
Parts for building all sorts of electrically-operated equipment . . . simple Electric Bell, real Morse Telegraph, Compass, Transformer, Electric Crane Grab and many electric motors. **£4.15.0.**



GEARS SET
Contains lots of parts — plus an engineering manual — for making dozens of drives and gears . . . twin-drives, intermittent drives, spur gearings, etc. **£1.8.6.**

SUPER TOOL SET
Contains automatic nut holder to speed up construction; a long screwdriver and a flexible drive spanner to reach right into the most awkward corners.
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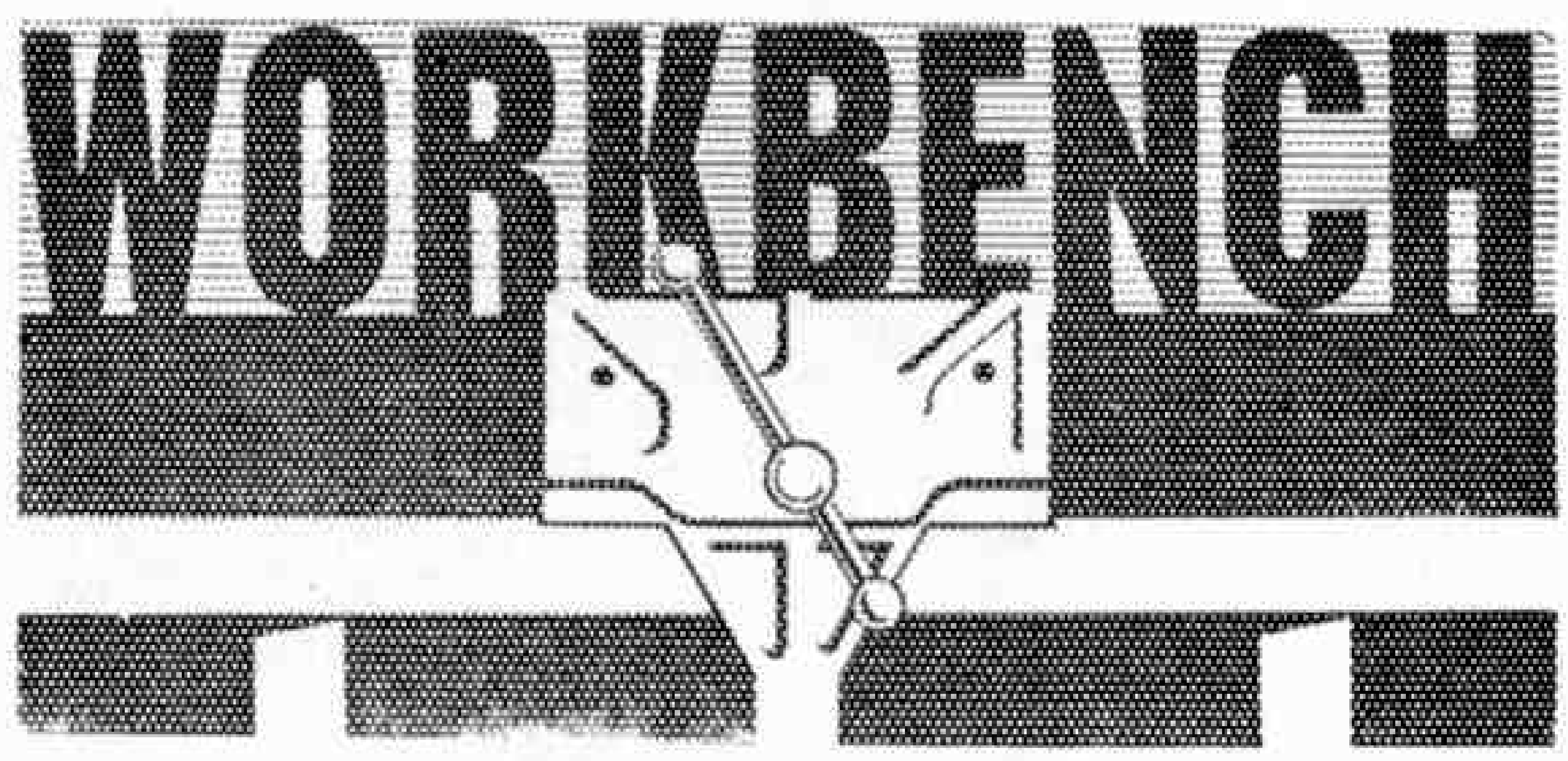
To convert one main Set into the next larger e.g.
Set 3 + Conversion Set 3A = Set 4.
It's as easy as that! Simply enlarge the scope of Meccano by adding a Conversion Set that helps build bigger, better models.
7 Conversion Sets—**from 12/11.**

THE WORLD'S GREATEST CONSTRUCTIONAL TOY

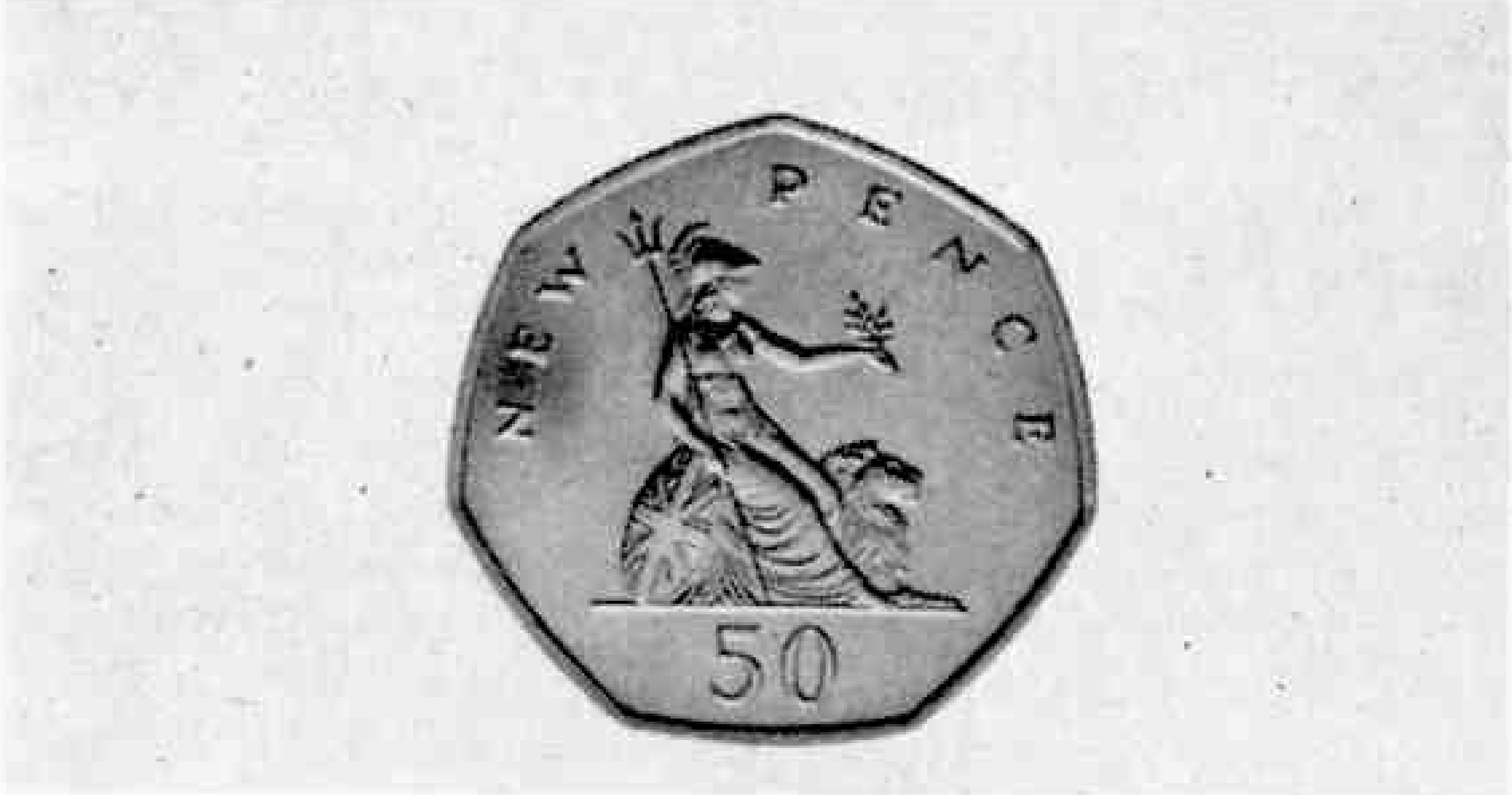


The Heptagon is coming !

No, it's not some kind of monster. It's the world's only seven-sided coin. It's worth 10s. and is called the 50p—which means 50 new pence—and is the latest addition to Britain's decimal currency. It was being brought into circulation on 14 October in place of the 10s. note, which will gradually " disappear ".

The other decimal coins already in use are the 5p (worth 1s) and the 10p (worth 2s) and these will be joined by the decimal " coppers "—the ½p (worth 1.2d), 1p (2.4d) and 2p (4.8d) when Britain changes to decimal currency on D (Decimal) Day, 15 February 1971. You can get a souvenir set of the coins (apart from the 50p) now from the banks for 5s 6d. The 50p is worth 10s because there will, of course, be 100 new pence in the decimal £.

The new " silver " coin (it's really an alloy called cupro-nickel) is the first seven-sided coin in the world to be brought into use. We have had coins worth " half a pound " before. They were called half sovereigns and were made of gold, but that was more than 50 years ago, so the 50 p is an old idea brought up to date.



It is 30 mm. in diameter, 2.5 mm. thick and weighs 13.5 gms.; is half way in size and weight between the halfcrown and two shilling piece; and was chosen because a round coin would have to be very large to be easily told apart from our other silver money, and a coin of such high value has to be easily recognised. A portrait of the Queen is on one side, and there is a new Britannia design on the " tails " side.

Using a shape based on the methematical concept of a " figure of constant breadth " was the idea of Mr. Hugh Conway, a member of the Decimal Currency Board—a Government department set up to ensure that Britain's changeover to decimals goes without a hitch. He is also a director of the famous engineering firm of Rolls-Royce and a vintage car enthusiast (he owns several Bugattis and has written a book about vintage cars). It was while he was thinking about a possible shape for the 50p that Mr. Conway remembered reading, as an apprentice, about the " equilateral curve heptagon "—the technical description of the coin's shape. It also has some of the advantages of a circle for the operation of coin-operated machines, since it will roll down a conventional coin testing track.

The 50p will supersede the 10s note for economy's sake. The 10s note has to be replaced every four months, but the new coin will last for more than 50 years.

Historical Note: The equilateral curve heptagon is sometimes called a Reuleaux polygon from a reference in the book " Kinematics of Machinery " by the mathematician Reuleaux, published in 1876. The Reuleaux polygon also forms a basic part of the Wankel rotary engine.

Model Engineer Exhibition

Final details for the 1969/70 Model Engineer Exhibition are at present being attended to, and from what we have seen of various models to be displayed this year, the 1969/70 Exhibition has all the marks of being the best yet. Once again Meccano Models will be on show, this year in greater abundance than in the past. Meccano Ltd. will be showing some of their many working display models, including the Traction Engine described in this month's issue of *Meccano Magazine*. One of the highlights concerning Meccano Models will be a giant working Ferris Wheel, always a popular subject for construction.

Last year's feature by the organisers took the form of Electric Round-the-pole Aircraft, and such was the interest shown that it will once again be featured this year. The pylon (constructed from Meccano parts) proved to be utterly reliable for the duration of last year's show, and will be utilised again, without any alterations. In addition to the R.T.P. Aircraft, there will be R.T.P. racing cars (mostly 1/24th scale) and boats too.

A large slot-car track will be featured again this year, on which the public can " have-a-go ", either with their own cars, or cars supplied by the E.C.R.A.

Models of every shape, size and description will be on display, covering in fact every aspect of popular model making. No Exhibition would be complete without support from the trade, and all the well known producers and distributors will be present.

The Exhibition opens on 31st December 1969, and closes on 10th January 1970, and will be held at The Seymour Hall, London W.1.

Photography competition

Due to a rather one-sided entry for this month's competition (all the entries being for one class) we decided to hold them over until next month, when we will publish the names of the winners and runners up of both classes. Readers are reminded that the competition closes on the 29th December, and no further entries can be accepted after that date.

R/C car booklet

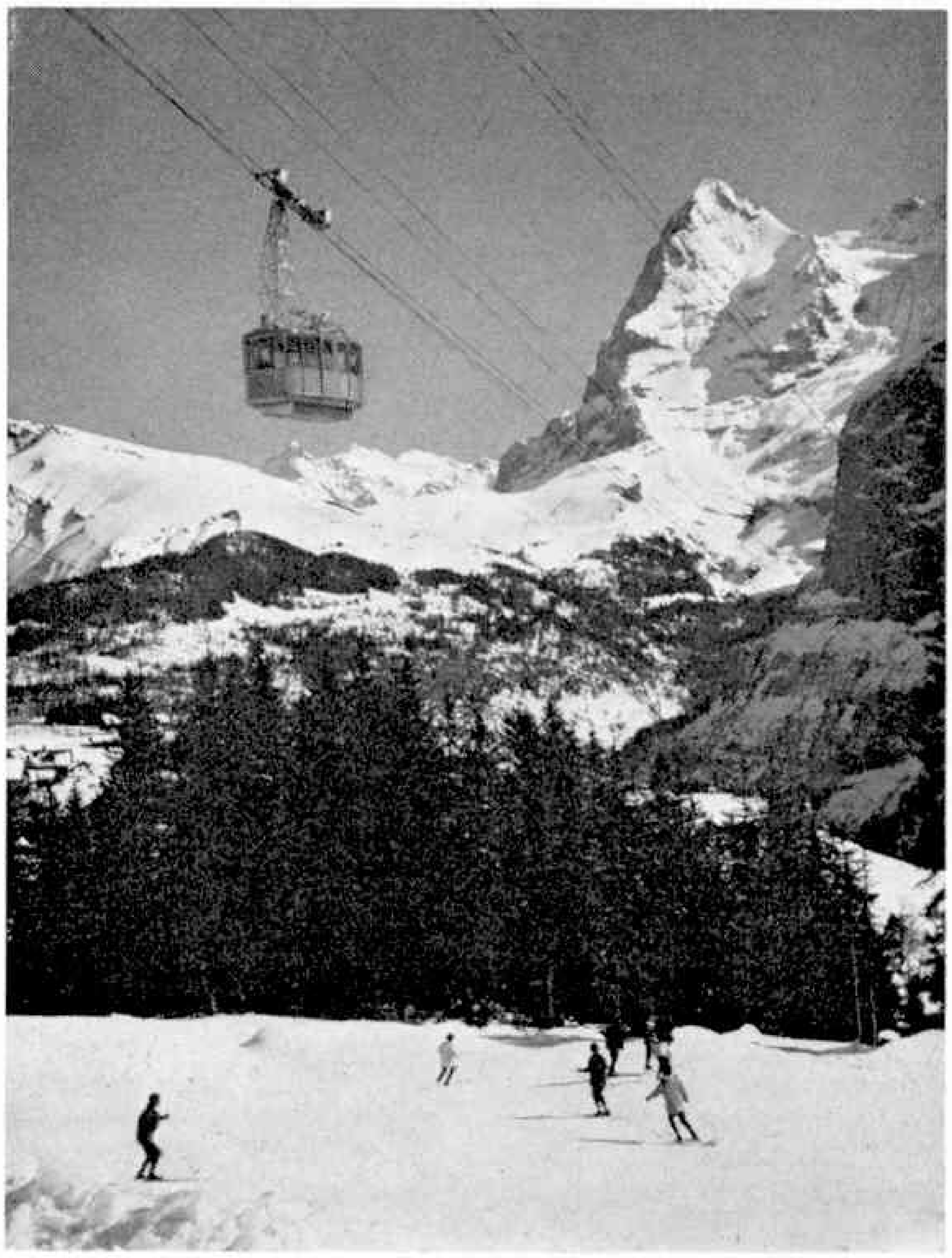
Free in the centre of this month's issue is a booklet giving detailed information for modellers, contemplating the construction of a radio controlled model car.

Written for *Meccano Magazine* by our Editorial Director, D. J. Laidlaw-Dickson, this booklet is the first in the car construction section of our Radio 4-2 programme, and forms the third and final phase of the series.

Our error

Promised in the October issue for November was an article on the construction of a simple lighthouse. A last minute photography hitch was the reason for its non-appearance and readers who looked forward to this feature will find it in this issue on page 618. Sorry!

ROPEWAYS OF THE WORLD

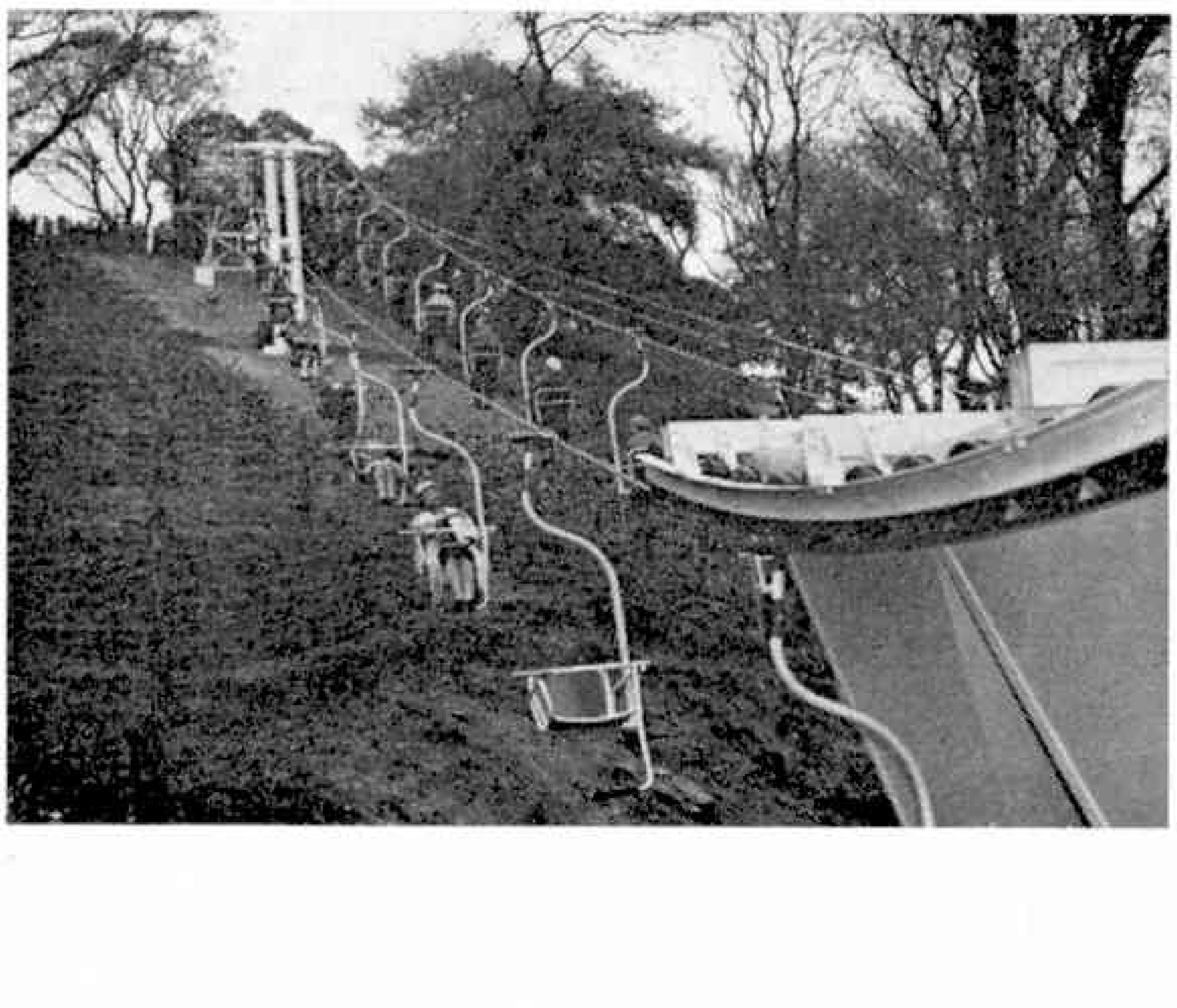


From the cold of the Swiss Alps to the heat of the desert, versatile cable ropeway systems cater for the speedy conveyance of passengers and materials over difficult terrain—RICHARD LEE

I EXPECT you have been for a ride in a cable car, but perhaps you never thought about it much at the time. Well, every time you go up or down a block of flats or offices in a lift you are really travelling in one of the many versions of cable-cars and aerial ropeway systems that can be found all over the world today.

Although they are called 'rope-ways', this is a technical word which automatically means *wire* rope-ways. Certainly there were no significant engineering structures ever built to convey goods by the use of fibre ropes of manilla or hemp. In fact it was the invention of the principle of twisting metal strands into a rope that really started the ropeway business. The earliest patents on record for a wire-rope spinning machine are credited to a Robert Newell in 1840. Once it became possible to obtain a reliable stranded twisted rope, many inventors constructed ropeway transport systems to convey either people or materials. They form a most interesting study because in nearly every case they have to be designed to work as well as possible over many different types of terrain and to handle many different commodities. That is why I have to keep describing them as 'systems'—for there are almost no two ropeways that are exactly alike.

In principle there are two methods of carrying goods by wire. The "mono-cable" arrangement carries its load on a moving overhead wire rope. Usually the rope is in the form of an endless circle so that containers travelling one way full, can be discharged and carried back to the starting point empty on the returning line. Often the containers are simply hung on the



Heading: Both beauty and excitement are mixed with this cable-car ride on the Schiltorn aerial ropeway. *Photo courtesy: Swiss National Tourist.*

Left: A passenger chairlift used at Dudley Zoo. Note the single chairs and simple attachment to the rope: this is a fixed clip type. *Photo courtesy: Brit. Ropeway Eng. Co.*

rope, by swan-neck cradles (so made as to be able to pass the supporting arms of pylons which hold the line up at intervals along its course). This arrangement will take loads up inclines of about 23 degrees and is usually kept in motion the whole time. In South India there is a mono-cable ropeway which takes the produce out of tea factories high in the Annemallais Hills, one tea chest to each cradle being hung at intervals of about every 100 yards. The cradles are shunted from one rope to another by automatic guides and travel in this way over twenty miles to the town of Pollachi in the plains below. One of the problems is to prevent chests of tea from theft as they can be pushed off the cradles with a long pole at certain places where the rope runs within reach of ground level!

The other main type is called a " bi-cable " system. In this method the main supporting rope is static and the load is suspended from it by a wheeled bogey. A traction rope attached to the carriage pulls it backwards and forwards. This has the advantage of being much simpler as the main rope is anchored. It does not have to travel around expensive winding pulleys and it is only half the length, as the span is not obliged to have a separate return system. The container is wound backwards and forwards as required. The bi-cable can travel up steeper inclines and again there are various devices which can pass the cable car from one section of ropeway onto the next.

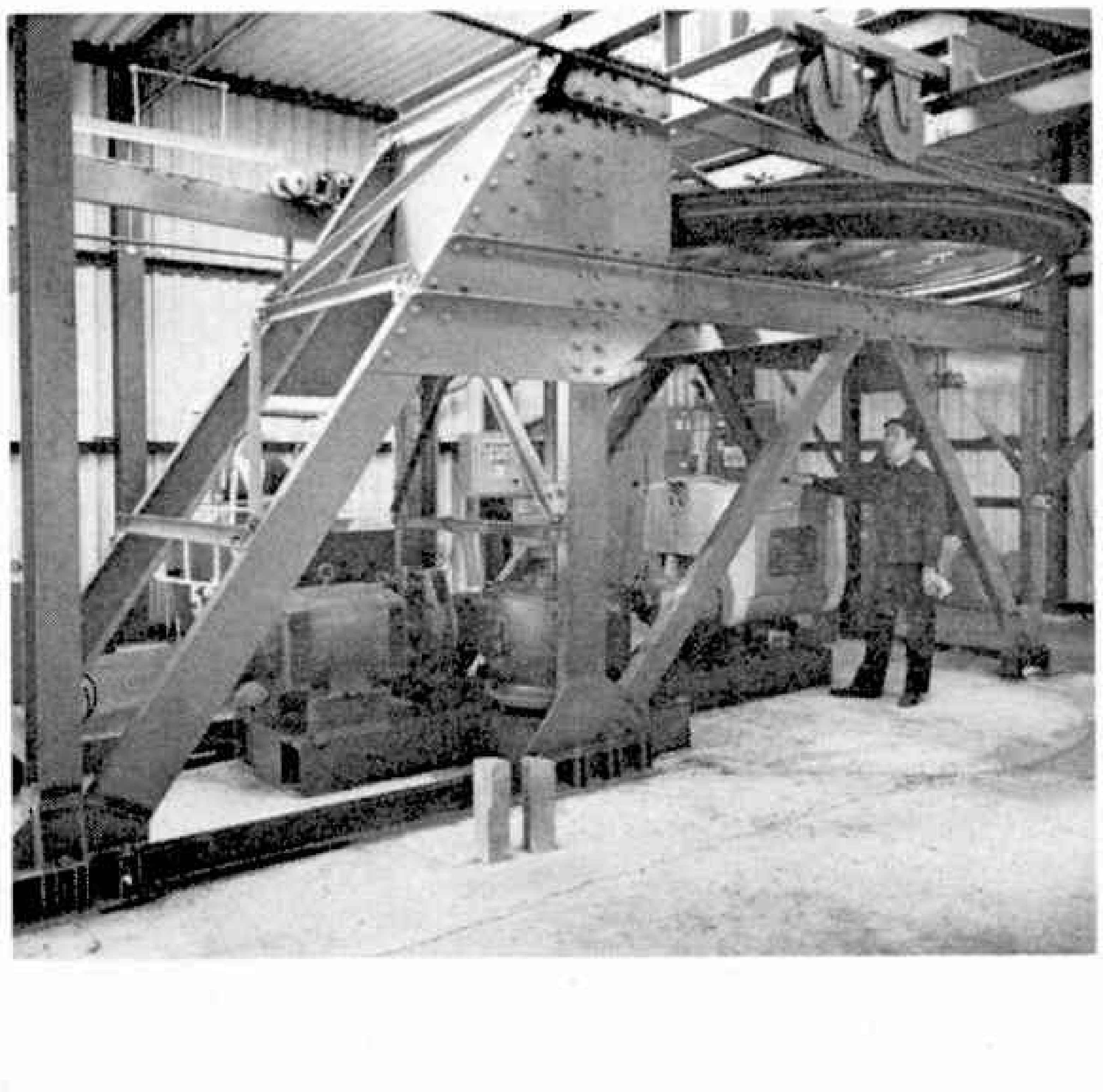
It is easy to understand how ropeways came to be so popular in under-developed and rugged country when we look at the list of advantages that an aerial ropeway system can offer. Five main features cover all of the important considerations, they are:

Above: High above the clouds and only a relatively thin line of cable to support you, such is the excitement of mountain ropeways.

Above right: Not all cable-cars are alike. In this photograph two different types are working on the same system.

Right: The 100 h.p. A.C. motor used to drive the Llandudno cabin-lift. *Photos courtesy of Swiss National Tourist and Brit. Ropeway Eng. Co.*

1. **Ropeways can sail over terrain which would present major civil engineering problems to install any other system of transport. Up sheer cliffs, over water, across bogs, valleys and mountains. The ropeways ignore all the problems which beset road and railway constructors.**
2. **Compared with costs of road building and tunnelling, ropeways are very cheap. They still cost big money, though, and Switzerland estimates her cable-car capital investment at around £200 million!**
3. **Ropeways can be run and maintained with a very small labour force compared to other methods of transport—thus they are cheap to operate; charges are reasonable—hence they are popular and profitable.**
4. **Power. The horse-power required for any type of ropeway is very low. The cost of the power consumption is an economic factor—but since the provision of a small power source is so much easier than large power units, this feature is specially attractive to under-developed countries.**



5. The reliability in operation is first-class. Although accidents have occurred on rope-ways, they are statistically much safer than road or rail travel. In addition the usual hazards of fog, bad weather or night operation make virtually no difference to the safety factor.

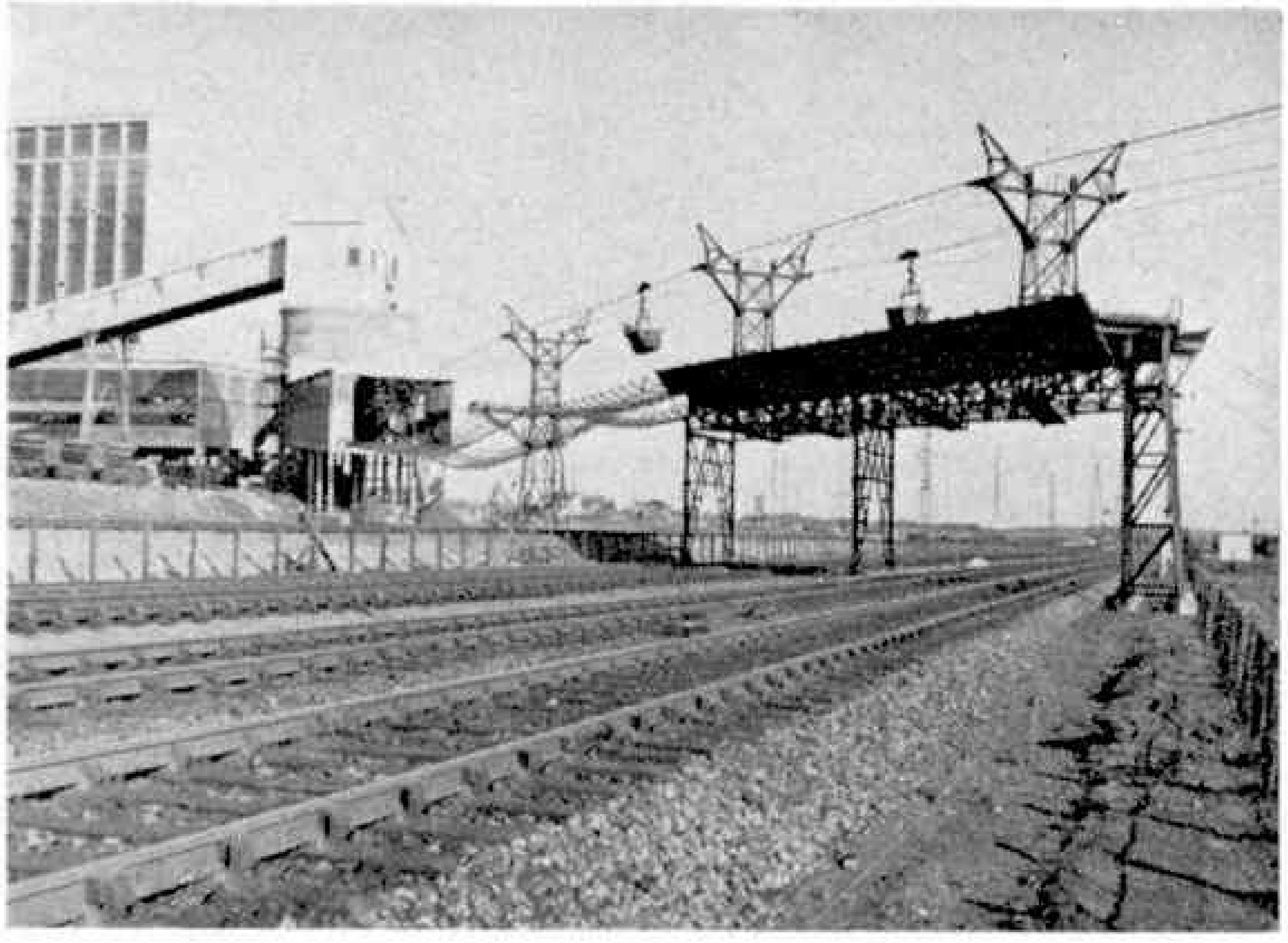
Ropeways are very versatile, not in each particular case, of course, since nearly every system is a specialised construction, but in general we can see a tremendous range of uses to which the ropeway has been adapted. I mentioned the internal lift—we cannot often see the rope in a modern lift but really lifts are just sophisticated versions of the colliery pit cages. Most people have seen the huge winding wheels over the pit head of a coal mine, which winds the men down to work and the coal trucks up to the surface.

Other adaptations of ropeway systems are the common ski-lift which takes ski-run competitors back up the snow slopes for another exhilarating downhill race. By combining a winding mechanism in the carriage of a bi-cable ropeway, civil engineers have devised a cable gantry which does all the donkey-work in dam building. Dams, of course, are built in valleys. By siting the cable anchor towers on the opposite sides of the valley where the dam is to be built, it is possible to have a cableway travelling to and fro over the area where the dam will be constructed. First in the removal of spoil from the valley surface, then later in the deposition of rocks and cement at the same site, the rope-way gantry carries material in and out. Imagine the quantities of material to be both taken away, and brought in. The ropeway bucket can discharge wet concrete at the very spot the men require—and travel to and fro to keep the men supplied.

The largest cableway of this sort was constructed to build the Colorado Boulder Dam. It had a span of 1,250 feet and could take material or pre-made parts of dam structure into position weighing up to 150 tons at a time! Industrial ropeways are in use to transport iron ore and other quarry or mine products to transit heads. Some of these are of tremendous lengths—the longest being in Sweden, a bi-cable running for sixty miles between Kristineberg and Boliden and carrying half a million tons of ore annually. Two monocable-ways of note are in Colombia and Equatorial Africa, both running for over 47 miles. A ropeway was erected in Canada for Expo '67 and proved its high performance by ferrying passengers in two directions at a rate of 2,800 persons hourly. Yet the best-known passenger lift ropeways of all must be in Switzerland! Tourists to this country can ride upwards by cable-cabin, up through the clouds and mists,—up silently (except for your heart-beats if you are a nervous type) swinging clear and free above the fantastic grandeur of the Swiss valleys and mountainsides. As the cars rise higher, swaying gently with the air currents as they are hauled into the colder upper air, fresh panoramas of snow clad peaks come into view and virtually change the scenery entirely with each rise of a few hundred feet. A ride in a cable-car is without doubt the most sensation-packed value for money that you can get. Some of the Swiss cable-cars have cabins that take 120 passengers at a time—but there are plenty of smaller carriages which only take six or eight people at once.

Above: The scenic beauty from a mountain ropeway is incomparable, as can be seen from this photograph. *Photo courtesy: Swiss National Tourist.*

Below: A bicable ropeway transporting 250 tons per hour of pit refuse from a British colliery. Our photograph shows it crossing railway lines. *Photo courtesy: Brit. Ropeway Eng. Co.*

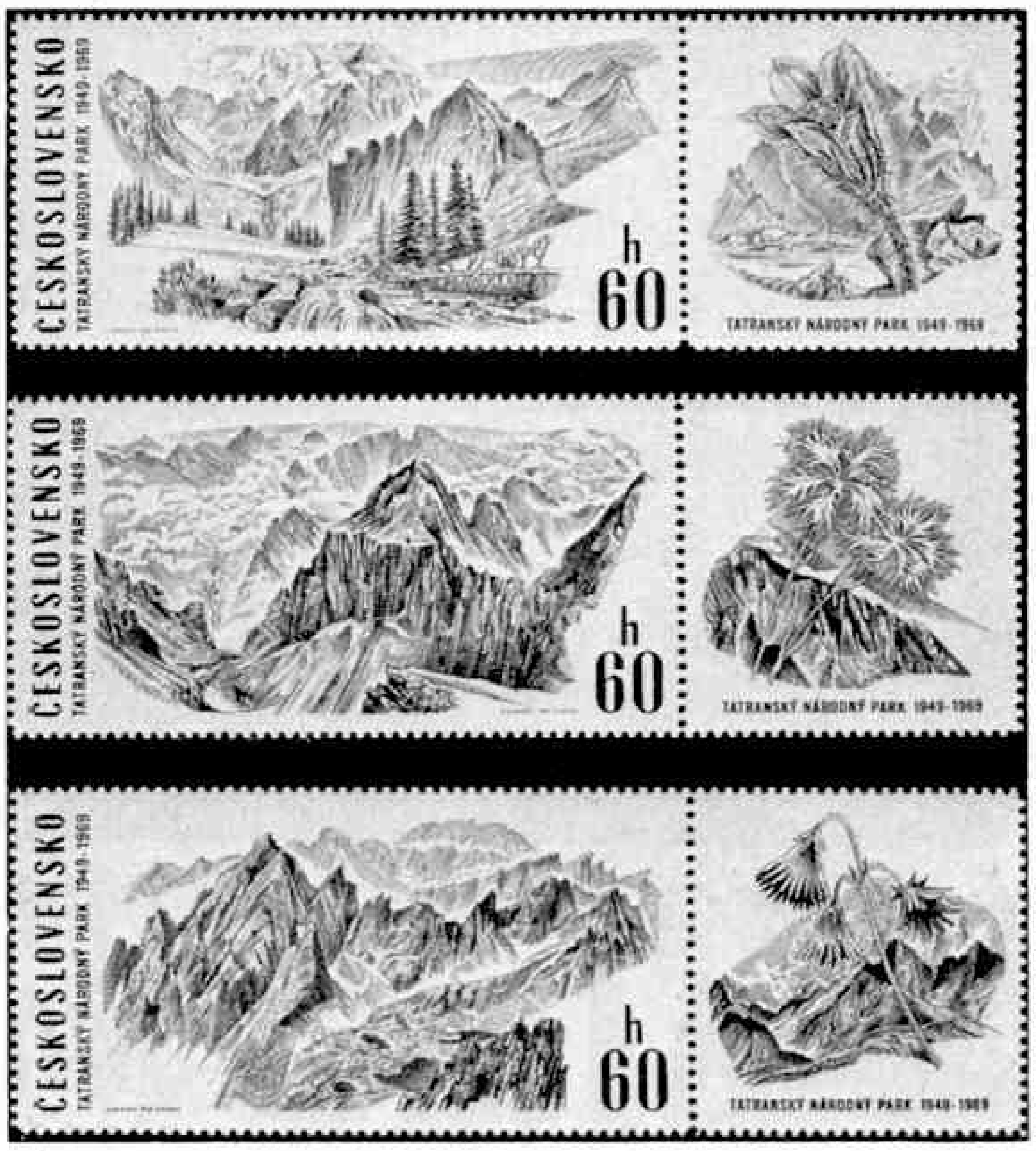


If you want to have a ride on a ropeway, you won't have to go abroad however. Go to Wales and see the newest and longest British Ropeway—opened only this year with the Prince of Wales' Investiture. It is at Llandudno, and runs for over a mile in length to give holiday-makers a scenic ride as you can see by the photograph. 'High-wire hobbyists' will find plenty of fascinating aspects in ropeway techniques and the presence of a man-size cabinlift in this country may now give a boost to ropeway modelling.

Ropeway techniques have already played a part in space travel. A light rope is attached to the nose cone of the giant Appollo moon rockets. It provides the last-moment escape route for the astronauts should things go wrong in the final count-down seconds before blast-off. Swinging from a light pulley cable they can descend to earth in a matter of seconds in the event of fire breaking out in the command module. It really is quite surprising what can be done with a length of wire rope!

NATIONAL PARKS ON STAMPS

by James A. Mackay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IT IS only within the past century that attempts have been made to preserve areas of great natural beauty and the wildlife which was formerly so abundant everywhere. Industrialisation and the growth of human population alike have been responsible for diminishing the size of the countryside and also for having an adverse effect on the animals and birds, the flowers and plants which were at one time found in great profusion. One of the best ways of combating the menace of encrouching civilisation is the creation of national parks where wildlife can be preserved from molestation, in the proper natural surroundings.

The Audubon Society in the United States was one of the earliest bodies to become aware of the destruction of nature which was rapidly taking place and almost a century ago began to agitate for the establishment of areas where such animals as the American buffalo, threatened with extinction, and the great Bald Eagle could find sanctuary. Today the United States has a large number of national parks or nature reserves which are among the most popular tourist attractions in the country. In 1934 a lengthy series of stamps was released depicting scenery in such well-known parks as Yellowstone, the Smoky Mountains and Acadia. The aboriginal cliff dwellings at Mesa Verde were depicted on the 4c stamp while Mount Rockwell and Two Medicine Lake Glacier were featured on the 9c value. In 1947 a stamp was issued to mark the inauguration of the Everglades National Park in Florida and featured a heron against a map of the state.

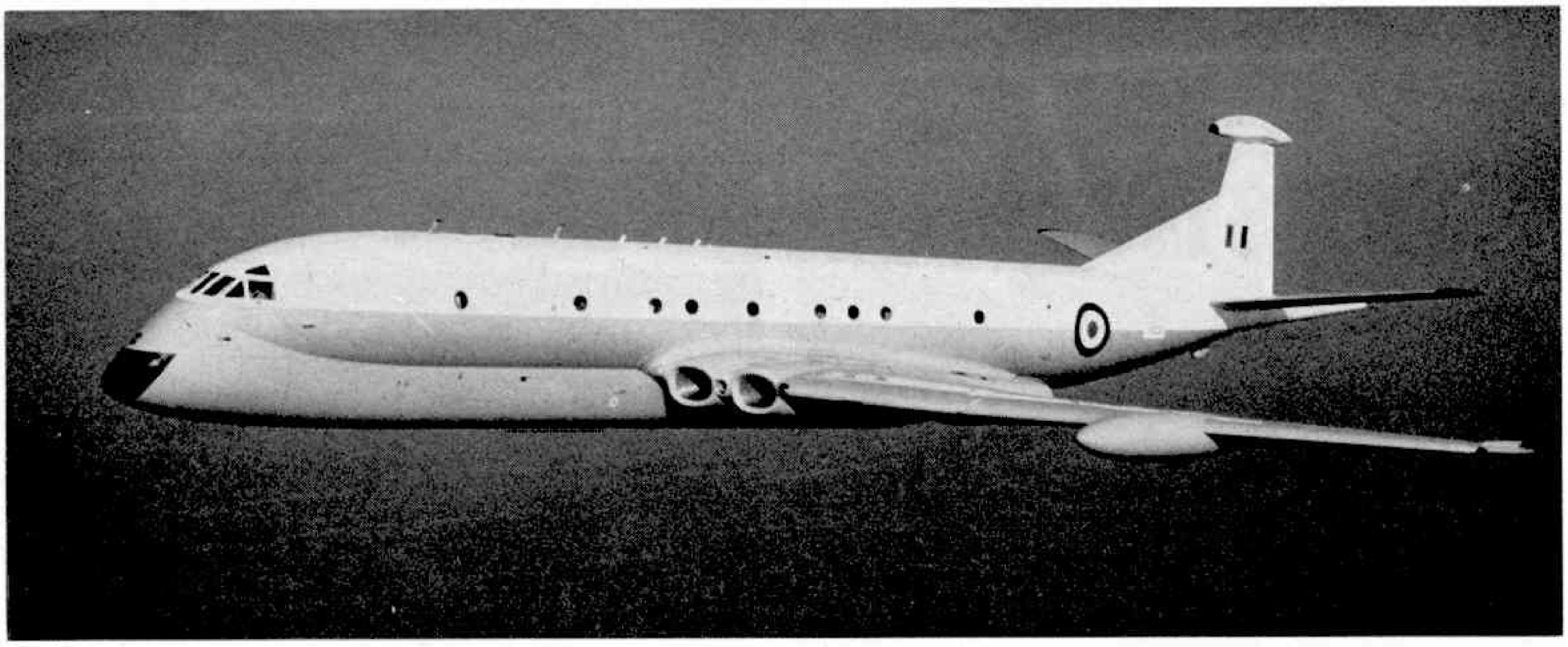
The most prolific of countries, so far as stamps featuring national parks is concerned, is Japan which released four stamps in 1936 to publicise the Fuji-Hakone National Park and since that date has produced well over a hundred stamps showing views in the national and quasi-national parks. The independent countries of Africa are also showing an increasing awareness of their rich natural heritage and in recent years national parks and game reserves have been established in most countries of that continent. Where formerly hunters went on safari with rifles they now come armed only with binoculars and cameras, and safaris of this type have become an important feature of tourism, particularly in East Africa.

Kenya has made several references to its game reserves in its stamps. The 10s. stamp of the 1954 definitive series featured the Royal Lodge at Sagana while the independence series of 1963 showed the famous Treetops Hotel, both in the national parks of Kenya. The stamps of the current series feature animals found in the game reserves. In 1967 Botswana issued three stamps to mark the opening of the Chobe Game Reserve and featured animals found in the area.

European countries have been in the forefront of the preservation movement and it is not surprising that many stamps have been issued, particularly by the countries in the Communist bloc, featuring national parks and the scenery and wildlife which they contain.

Perhaps the best of the stamps in this theme are those which have been released by Czechoslovakia in the past few years. In 1949 the Czech government established the Tatra National Park in the mountainous region in the south of the country. Here rare animals such as the European bear and the Chamois were given a chance to recover from near extinction. Two years later a stamp was issued featuring a workers' recreation centre in the Tatra mountains while, in 1957, a set of four stamps was issued depicting animals and flowers found in the Tatra National Park. The tenth anniversary of the park was commemorated by a set of five stamps which showed such rarities as the lynx, wolf, European bison and marmots. In 1963 a set of stamps was released featuring mountain animals of the Tatras and the following year a tourist series included a view of the Great Tatra Mountains where winter-sports are now very popular. Mountain birds were the subject of a multicoloured series in 1965 and some of the smaller animals of the Tatra National Park appeared on a set of stamps in 1967.

The 20th anniversary of the Tatra National Park was celebrated in September by a handsome set of six stamps. Three of the stamps are in the denomination of 60 hellers and feature some of the spectacular scenery for which these mountains are famous. Attached to each stamp is a coupon or label depicting different flowers of the region, with mountain scenery in the background. The other three stamps, in denomination of 1.60 crowns, are printed in multicolour recess and likewise feature scenery of the national park. It is expected that more stamps featuring the Tatras will appear next year when the national park will be the venue of the 1970 World Ski Championships.



AIR NEWS

'MIGHTY HUNTERS and EYES IN THE DARK'

by John W. R. Taylor

" Mighty Hunter " joins the R.A.F.

On October 2nd, the Royal Air Force took delivery of its first Hawker Siddeley Nimrod MR. Mk.1 maritime reconnaissance aircraft. Those readers who know their Bible will remember that the original Nimrod is described in the Book of Genesis as " a mighty hunter before the Lord." It is no coincidence that this latest R.A.F. combat aircraft is named after such a man, for there is no more formidable submarine hunter-killer in the world today.

Deep-diving nuclear-powered submarines will never be easy to find and destroy, but the 38 Nimrods ordered for the R.A.F. will be packed with the most up-to-the-minute detection devices and weapons. The search radar is powerful enough to pick up even the periscope or snorkel of a submerged submarine over a wide area, while the aircraft's electronic countermeasures (ECM) equipment can track down submarines or surface ships by pinpointing transmissions from any radar that they might be using.

The Nimrod can detect the presence of a conventionally-powered submarine by means of a device which " sniffs " for even tiny traces of exhaust fumes from diesel engines. The precise position of any kind of submerged submarine can be established by dropping a pattern of sono-buoys into the water and by using a magnetic anomaly detector (MAD) in the tail " sting " which works on the principle that a large mass of metal under the surface will disturb the earth's magnetic field at that spot.

All but three of the eleven crew-members work in a large tactical compartment in the main cabin. At their disposal is a highly-advanced computerised navigation system which is linked with the aircraft's flight system and detection devices. This provides automatic control and navigation as the Nimrod races out to its target area at high subsonic speed. During search and patrol—which can be prolonged by loitering on the power of only two of the four Rolls-Royce Spey turbofan engines—the nav system gives an instantaneous display of the entire tactical situation.

The basic airframe of the Nimrod is similar to that of the Comet 4C airliner. Operational equipment and weapons are carried in a " pannier " which is slung under the original circular pressure-cabin and gives the aircraft its deep figure-8 section fuselage shape. Not much may be said about the weapons themselves at present, but they include powerful air-to-surface missiles like the new TV-guided Martel, nuclear depth charges and torpedoes which home automatically on the noise from a submarine's engines. The main weapon-bay is 50 ft. long and is supplemented by underwing missile racks.

Considerable thought has been devoted to crew comfort during long patrols. The cabin is pressurised and air-conditioned, well-lighted and as spacious as that of the original Comet airliner, enabling the crew to walk around the entire cabin area in flight. There is a combined galley and dining area aft of the tactical compartment.

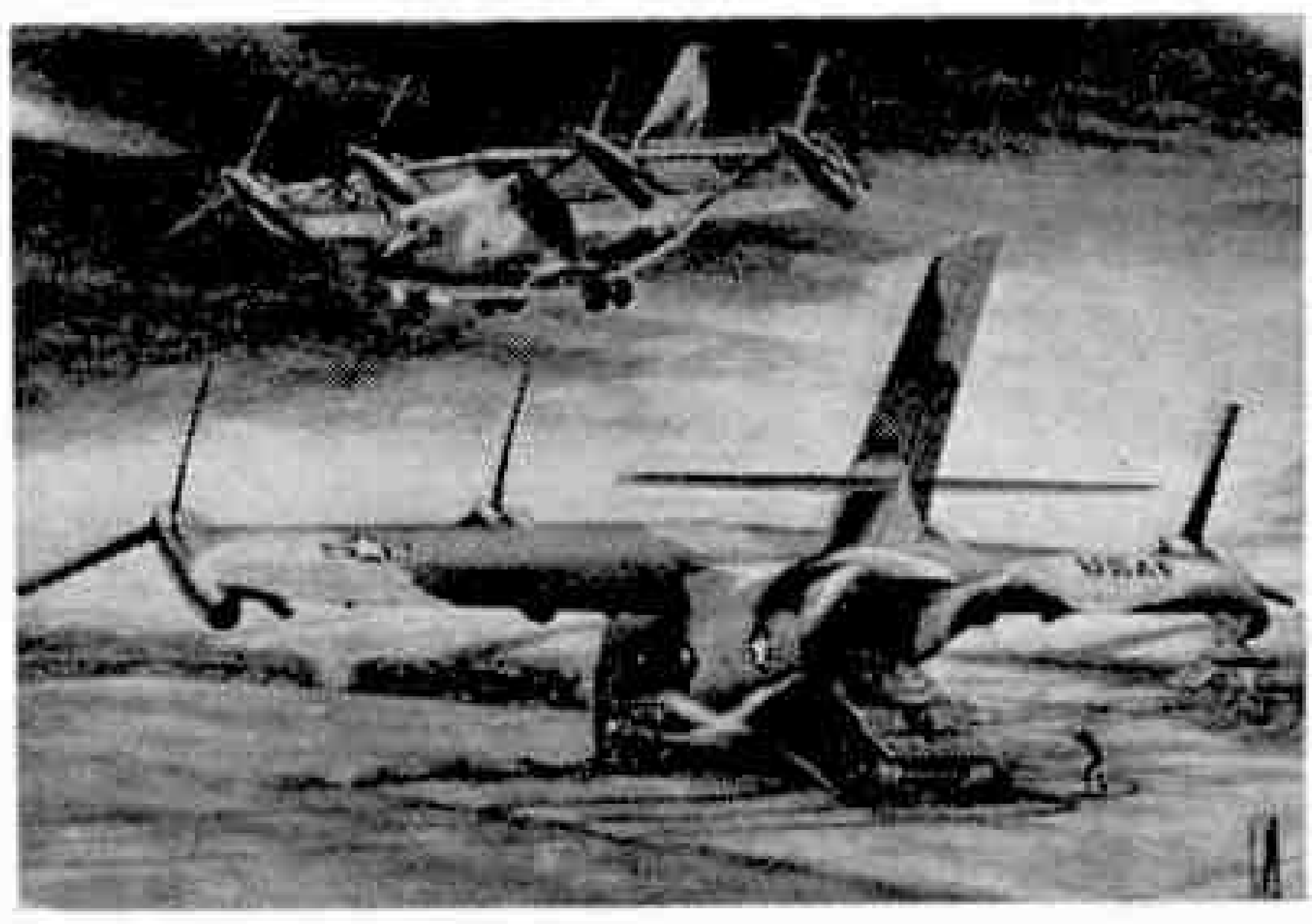
Cameras and electronic equipment can be carried for day and night reconnaissance and, if required, the Nimrod can be used to fly 45 fully-equipped troops at high speed to an overseas trouble-spot. Altogether, it is quite an aeroplane!

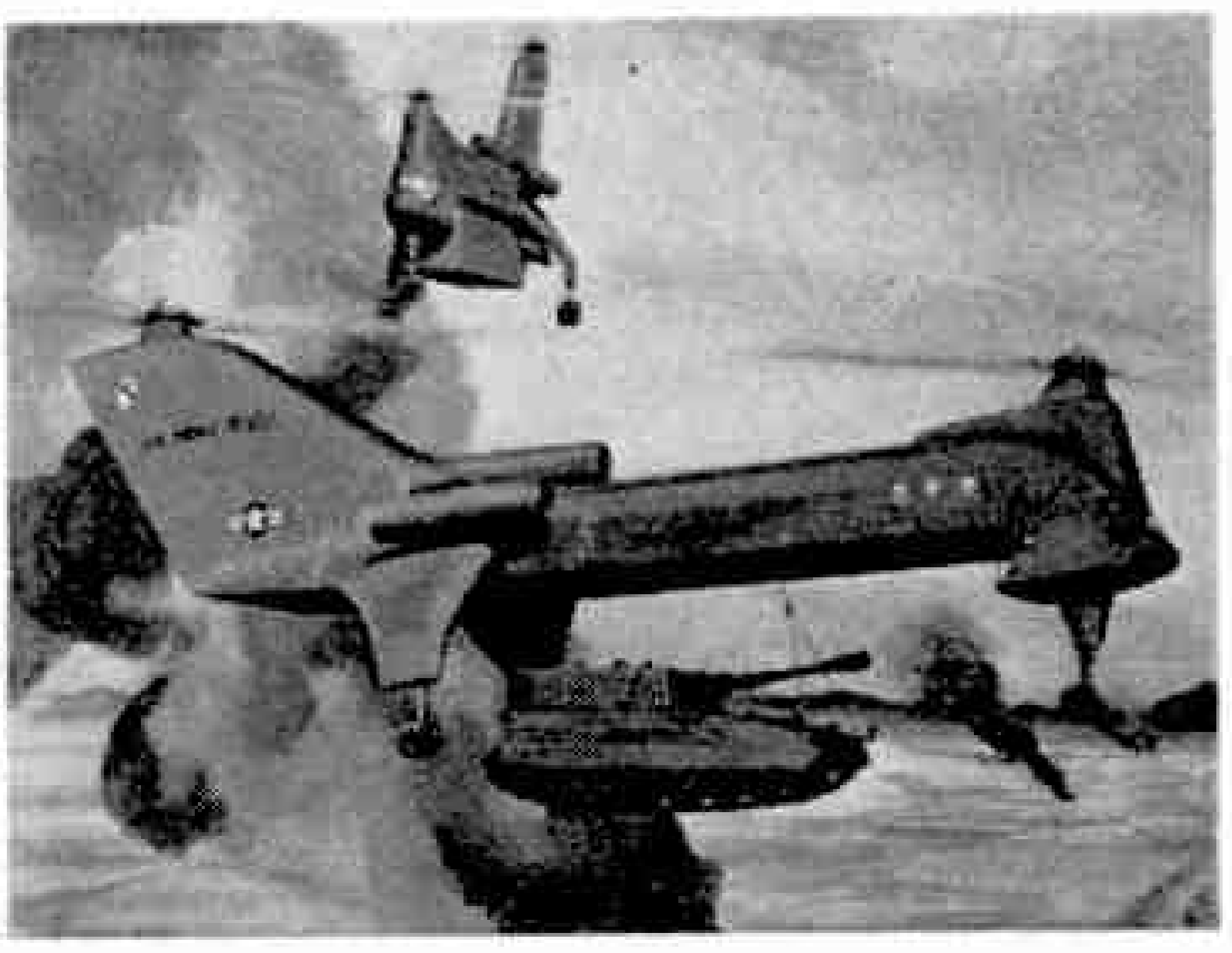
Left: The new *Hawker Siddeley Nimrod MR Mk. 1,* recently delivered to the R.A.F.

Right: The *Boeing LIT Project* delivering Sheridan Tanks.

Far right: *Boeing HLH* (heavy-lift helicopter) carrying a 155 mm. howitzer.

Below: The *Murrayair M.A.-1* prototype built by Air New Zealand.





Boeing—past, present and future

Earlier this year, in *Meccano Magazine,* I referred to the huge new factory which Boeing had to build as an assembly hall for its Model 747 jumbo-jets. It is very different from the little wooden structure which was the company's "home" during the first World War.

In that war, not a single combat aircraft of American design was good enough to serve in France. Times have certainly changed, for the U.S.A.F. regards its present-day Boeing B-52 Stratofortress bombers so highly that it is seeking ways of extending their useful life into the 'seventies. By the time you read this, engineers will have installed on a B-52H a pair of "electronic eyes" which will enable the crew to "close the window shades" on the flight deck and fly blind by day or night. Protected from the dazzling flashes of bomb-bursts, they will still be kept fully aware of what is happening outside, the characteristics of the terrain below them and their precise position.

The "eyes" will take the form of two small steerable turrets under the bomber's nose, one housing a TV camera and the other an infra-red sensor. Looking forward and downwards, they will transmit a picture in TV form to the cockpit and navigator stations.

In addition to keeping its big bombers battle-worthy in this way, and producing a whole family of jet airliners, Boeing is making plans to strengthen its position in the VTOL (vertical take-off and landing) market. As a follow-up to its present CH-46 Sea Knight and CH-47 Chinook twin-turbine military helicopters, it has designed a big tandem-rotor flying-crane to meet the U.S. Army's HLH (heavy-lift helicopter) requirement. A typical 26-ton payload for such a vehicle, shown in the above illustration on this page, would be a 155 mm. self-propelled howitzer slung under the fuselage, with the gun crew and ammunition carried inside the cabin.

In answer to another U.S. Army requirement, for an LIT (light intra-theatre transport), Boeing is studying a four-turboprop tilt-wing design which would be able to cruise at 460 m.p.h., hover like a helicopter, land at about 40 m.p.h. on small fields when carrying heavy loads such as 16½-ton Sheridan tanks, and take off and land vertically with smaller loads.

Operating as a search and rescue aircraft, the LIT could fly 1,000 miles to where its services were required, search for 30 minutes and hover for 30 minutes during rescue operations. Medical treatment of persons hauled to safety could begin immediately they were on board, as the aircraft's cabin would be roomy enough to house para-medical teams and their equipment.

Time is money

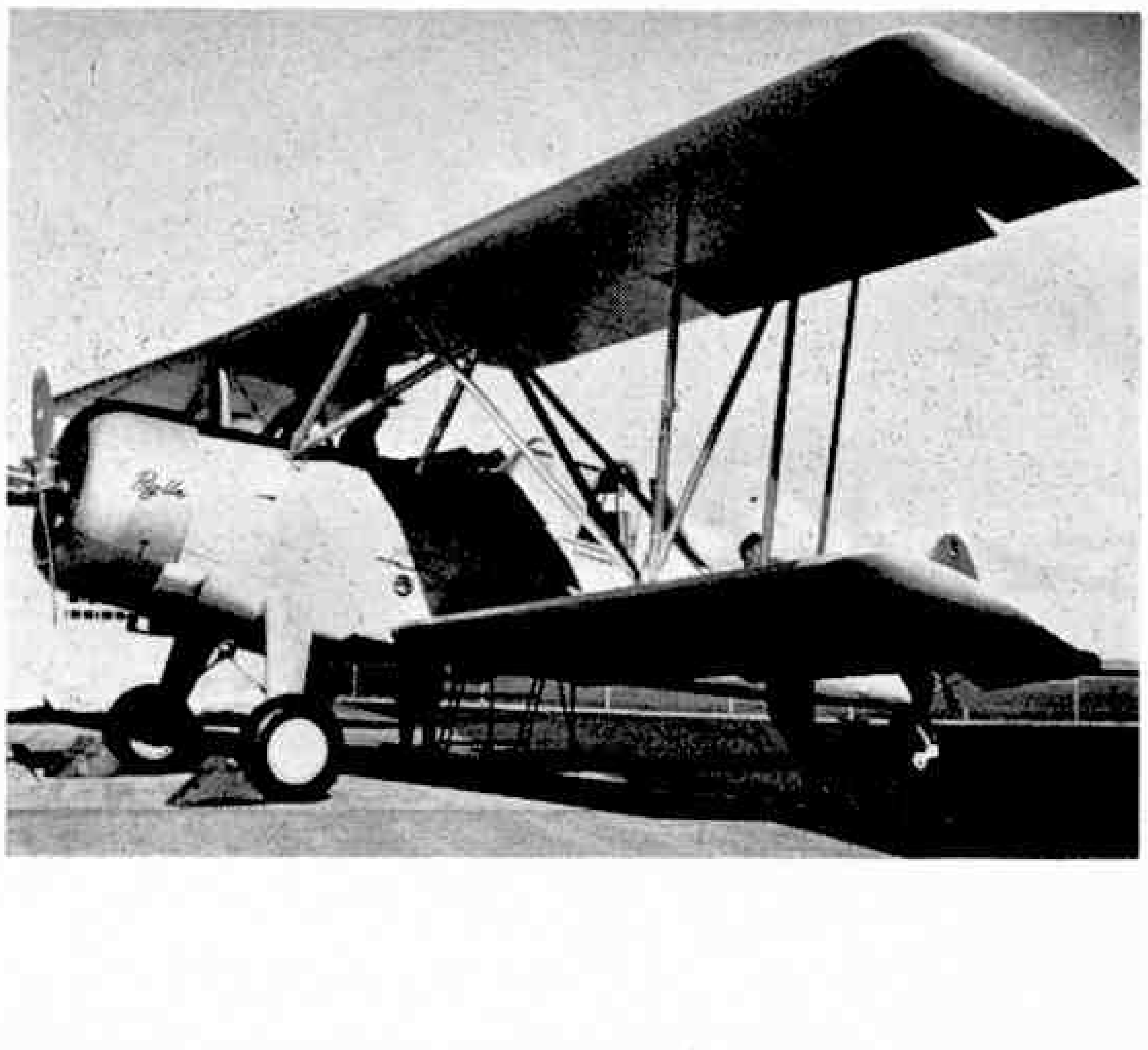
When the State of Alaska received $900 million for the leases to 450,858 acres of waste-land last September, from companies which hope to find rich oil strikes, it made big news in the world's press. The winning bidders at the auction had to pay 20 per cent of their bid by cheque on the spot. If these cheques had been cleared by the banks in the normal way, the State would have lost several days' interest on this money. So, it arranged to have a big DC-8 "Super Sixty" airliner of United Air Lines standing by to whisk representatives of its Bank to New York overnight, so that the cheques could be deposited next morning. The resulting additional interest is estimated at more than $80,000.

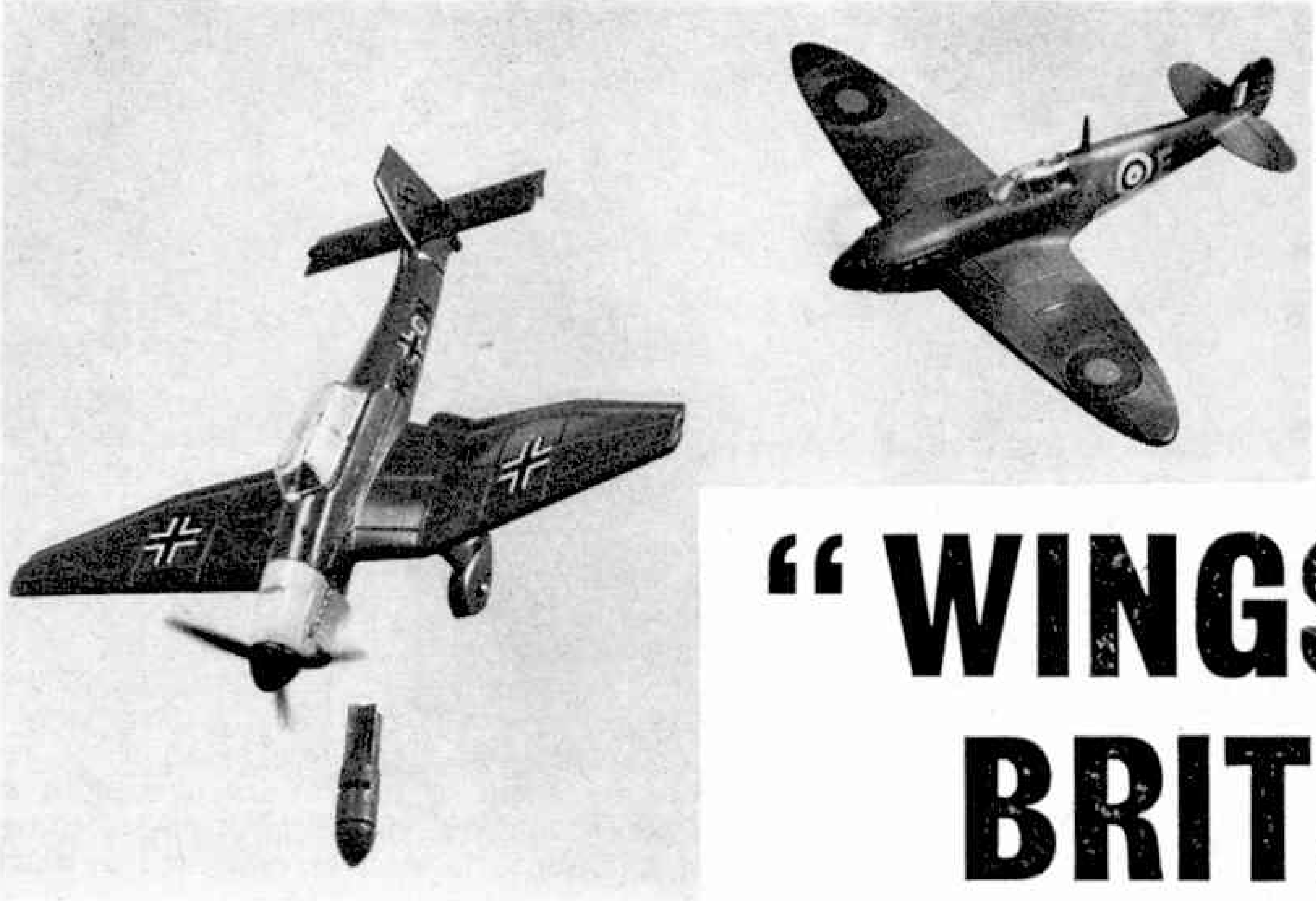
When is a Stearman not . . . ?

The answer is ...... after Air New Zealand have finished with it. Believe it or not, the crop-dusting biplane illustrated on this page began as a war-surplus Stearman 75 Kaydet trainer. Air New Zealand were commissioned by Murrayair of Hawaii to convert it into an agricultural machine with the largest chemical hopper ever fitted to a single-engined ag-plane, with a capacity of nearly 1½ tons.

By the time they had finished, little remained of the original aircraft except for the basic fuselage structure, tail unit and some parts of the undercarriage. The standard 220 h.p. engine was replaced by a 600 h.p. Pratt & Whitney R-1340 radial. Wing area was increased by 35 per cent by fitting a new aluminium centre-section, containing the fuel tank, and other changes. The fuselage was lengthened and strengthened and covered with glass-fibre panels instead of fabric; and the pilot's cockpit was fitted with a raised seat, under an enclosed canopy, with room for a loader-driver by his side.

The resulting ag-plane, known as the Murrayair MA-1, has a take-off weight of 6,250 lb. instead of the original 2,700 lb. and has completed its flight testing so successfully that Murrayair plan to put it into production.



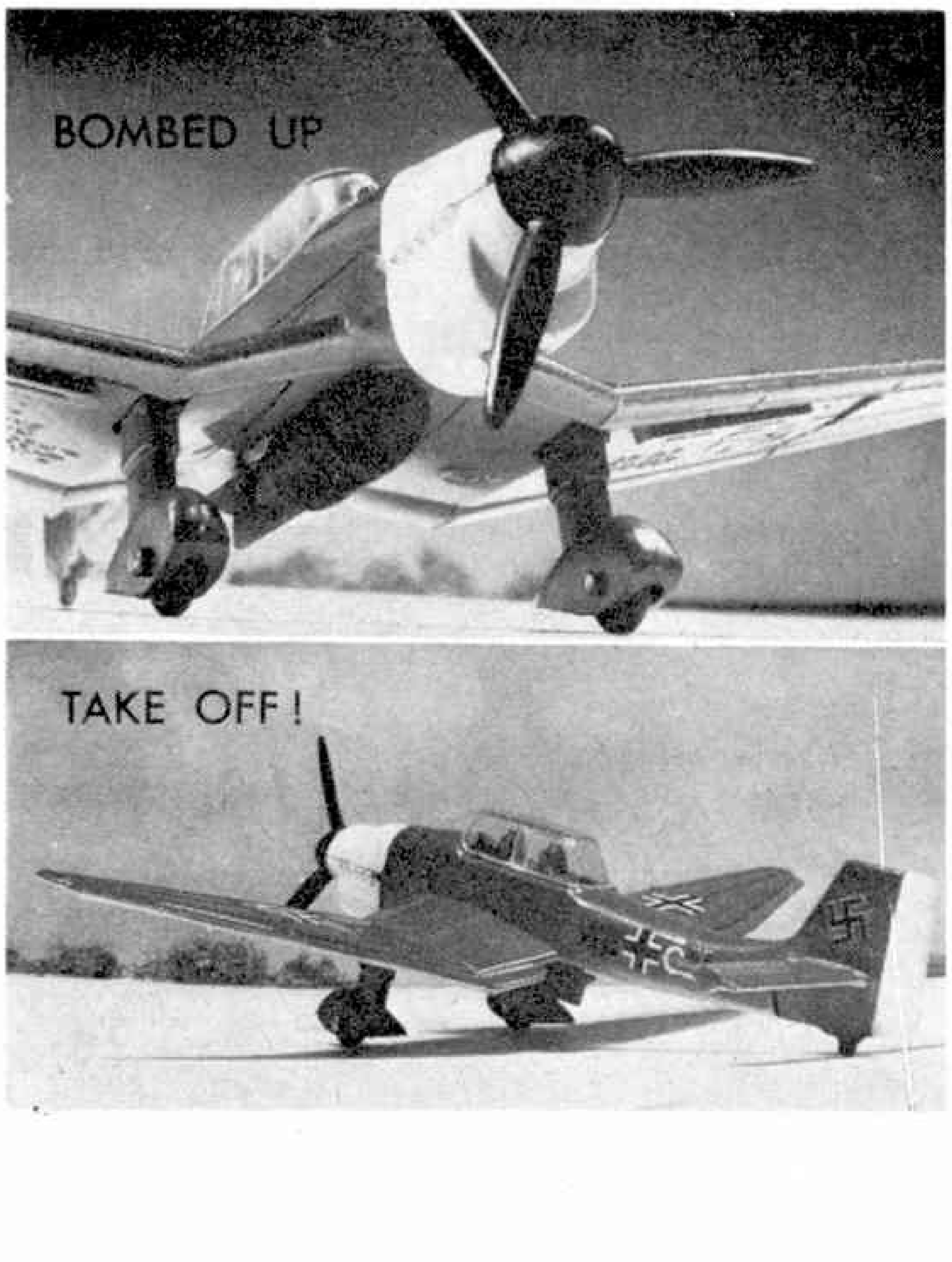


DINKY TOY NEWS

"WINGS OVER BRITAIN"

Two new Dinky Toy aircraft from World War II . . . Chris Jelley

"NEVER HAS so much been owed by so many to so few." Thus magnificently did Winston Churchill, in 1940, sum up the unredeemable debt owed by all Britons to those few Royal Air Force heroes who fought and won—against seemingly impossible odds—the tremendous air battle for the very survival of this free country of ours: the furious struggle which went down in history as the Battle of Britain.



The Battle of Britain is a part of history which we in this country remember every year, but this year, particularly, the memorable struggle was brought home to us more vividly than usual by the United Artists film "Battle of Britain", released on September 15, the official anniversary day of the original battle. This film is the most realistic, authentic and truly awe-inspiring portrayal of those air-war days of 29 years ago that has ever been produced for the cinema. It took a long time and a great deal of money to make, but the results were worth it. It is now a tremendous success. Even while it was being made, however, it created an enormous amount of interest and one company whose interest was especially keen was Meccano Limited up in Liverpool. They, at the same time, were making two Dinky Toys models based on two of the Second World War's most famous fighting aircraft; one a world-beating British fighter, the Supermarine Spitfire Mark II and the other a deadly German dive-bomber, the Junkers JU 87b Stuka.

These new Dinky Toys are now available—and they are both great! They revolutionise die-cast modelling of the Dinky Toy type. In fact, they cannot be compared with any other type of similar model, simply because they both incorporate features which have never before been seen on any similar model. The Spitfire, for example, has a revolving motor-driven propeller, while the Stuka comes complete with a large "working" bomb!

Top: Trick photograph! A simulated flying sequence showing the new Dinky Spitfire swinging in to attack the Stuka, as it releases its bomb.

Left: Two detailed shots of the Stuka, showing its highly realistic lines.

In the case of the Spitfire, No. 719, the propeller is driven by a tiny little electric motor buried in the nose and drawing its power from a small Ever Ready D.23 or equivalent battery carried inside the fuselage. To obtain access to the battery, a panel in the base of the fuselage is simply unscrewed. For the electrically minded, the motor itself is a rather clever two-pole unit, as opposed to the more usual three-pole motor, and this does away with the need for an on/off switch, as well as adding to realism. The reason is that a two-pole electric motor will not start automatically when current is applied, but rather must have its armature spun to start the motor operating. Once started, it will continue running until either the current is cut off or the revolving armature is stopped. No current is of course used when the motor is at rest, therefore, in the Spit, this means that the battery can be permanently connected to the motor which can then be started as required by simply flicking the propeller in an anti-clockwise direction, the prop being secured on the motor shaft. Stoping the prop. stops the motor—it's easy! Care, however, should be taken to ensure that the propeller is not held stationary out of its normal resting position, as this completes the electrical circuit and drains the battery rapidly. For this reason, the model should never be placed on the ground with its undercarriage up, because of lack of clearance for the propeller. Full operating instructions are packed with the model.

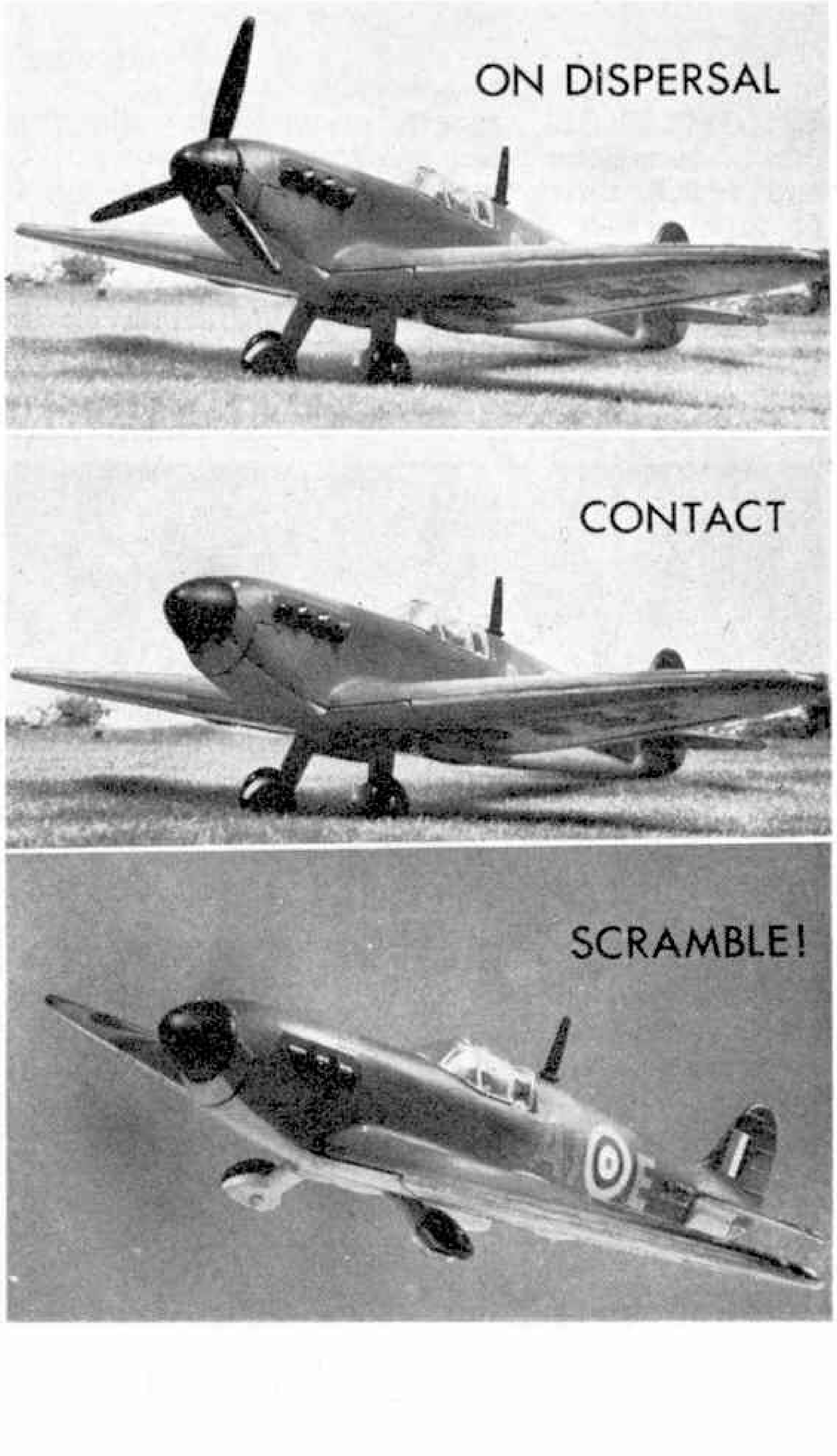
To avoid any possible misunderstanding, it should be pointed out that, being die-cast in heavy metal, the Dinky Spitfire will not of course fly, nor will it " taxi " on the ground, but the revolving propeller nonetheless makes it extremely realistic in appearance. Realism, in fact, is something which applies to the model as a whole—not only its overall shape, but also its transparent cockpit canopy, its radio aerial, its underwing radiator and oil-cooling air-intake and especially its retractable undercarriage which lowers for ground operation and folds away into the wings for flight. Casting detail generally is plentiful with representations of engine exhausts, ailerons, rudder, panels and so on, while the finish is in realistic camouflage colours of brown and green patches on the model's top surfaces and a very pale green on the underneath surfaces. Full-colour R.A.F. roundels and identification letters are transferred in all the correct places, these adding the finishing touches to a beautiful model of a beautiful aircraft.

During the war, the sight of a Spitfire was enough to strike terror in the heart of an enemy pilot, but it was also true that the sight of an attacking Stuka as it screamed down in an almost vertical dive to bomb its target could strike terror into people on the ground. The Stuka was certainly an easily-recognised aircraft with its inverted gull-wings, fixed undercarriage, large, distinctive fin and long tailplane and the new Dinky, No. 721, reproduces all this exactly. Again, casting detail is minute with such things as exhausts, engine cowling ailerons and rudder, etc., being clearly marked. Transparent cockpit canopy and revolving propeller are also present, but the latter is not motor-driven. As in the case of the Spitfire, authenticity includes the correct colour finish—in this case olive drab fuselage, wing and tailplane top surfaces and undercarriage legs, pale blue under surfaces and yellow engine cowling and rudder—and German marking transfers are of course also present in full.

I have, however, left the best and most outstanding feature to the last. The Stuka in real life, was a much-feared dive-bomber and so it stands to reason that no model of it would be complete without a bomb load. True to form, therefore, the Dinky has such a load, or, rather, it carries one big and deadly-looking bomb slung beneath the fuselage between the wings. This is no fixed " Show " bomb, either. It really works in the sense that it can be released by pressing a small trigger in the right-hand side of the fuselage just behind the cockpit and, as if that wasn't enough, it is also made to take a cap such as the sort supplied in rolls for toy pistols. This, coupled with the design of the bomb, means that when the bomb hits a hard surface—bang!

It takes a fair bit of practice to reach a reasonable degree of accuracy on " bombing raids ", but, whether you're accurate or not, you can still have great fun. I know this from experience—and I'm paid for it as well!

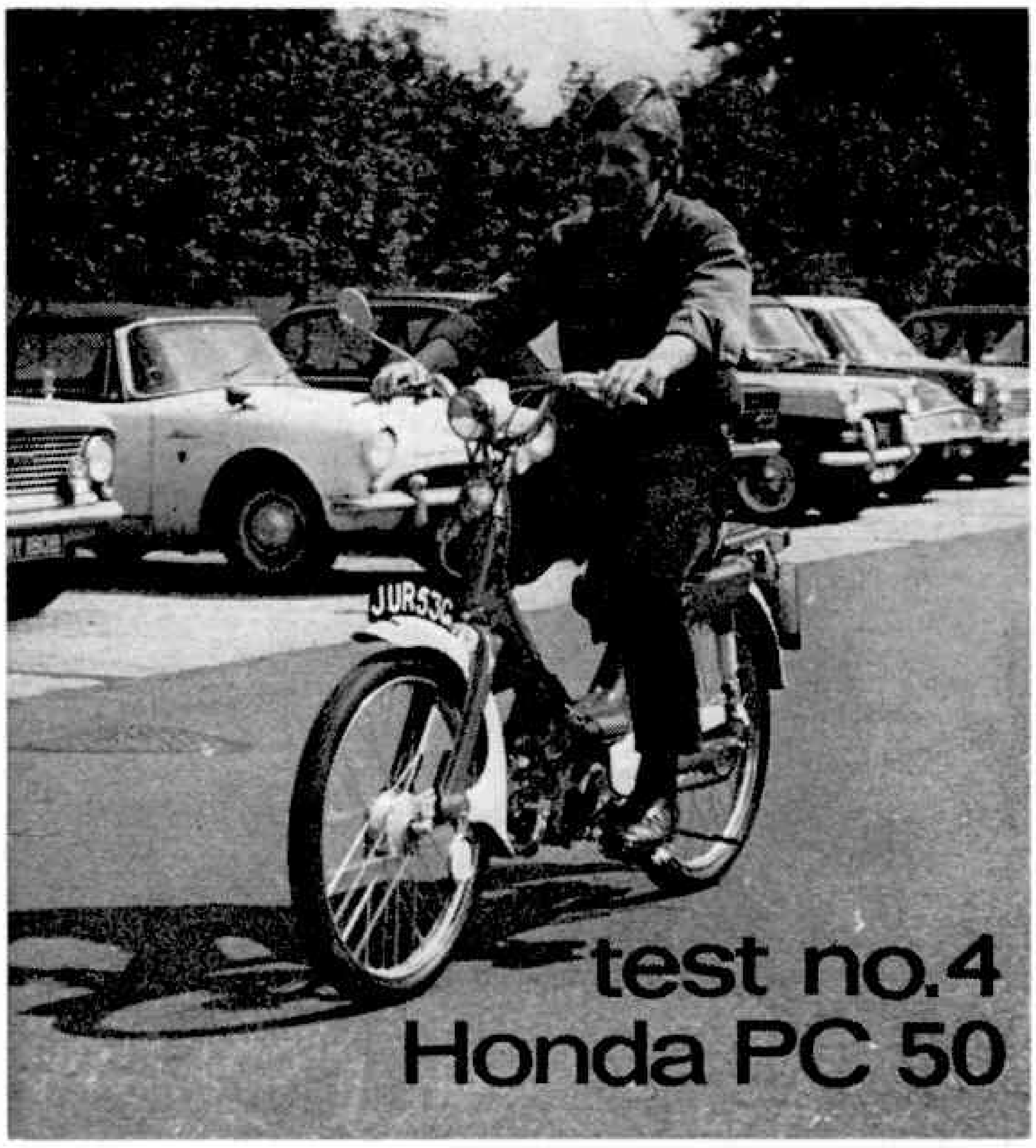
Both the Spitfire and Stuka are large models, the Spit having a wingspan of 6$\frac{13}{16}$ in. and the Stuka a span of 7$\frac{1}{2}$ in. Both models are chock full of play value which will make them ideal " toys " for younger children, but they are also top quality scale reproductions: tough, heavy and beautifully detailed, therefore they make outstanding pieces for the collector who wants only to place them on show. Even ignoring their appeal as pure toys and collectors' items, they make ideal ornaments for a window ledge or sideboard. Anybody is likely to buy an ornament, and so these new Dinkys, in reality, will appeal to everybody. It's not many models could claim that!



You'd swear these photographs were " still " shots straight from the Battle of Britain film showing a real aircraft in action, but in fact they show the Dinky Spitfire in settings designed to illustrate just how realistic the model appears.

ON TWO WHEELS

Meccano Staff test Motorcycles Scooters and Mopeds



The Honda PC50 is without a doubt the easiest machine to ride that we've tested to date. Ideal for the youngster who wants to travel with the minimum of effort, and is unconcerned with its low top speed.

RIGHTLY OR wrongly, many parents disapprove of youngsters riding motorcycles or even scooters, and forbid their sons to own one. The number of parents who would forbid ownership of a bicycle are however, very small indeed, and the subject of this month's report is about one of the simplest, easiest powered two wheelers on today's market, a machine which is as easy as a bicycle to ride, and with a top speed of only 30 miles per hour: The Honda P.C. 50.

To find out just how simple it is to ride this machine we loaned it to several people who had never ridden a powered two wheeler in their lives. We would mention at this point that these persons hold car driving licences which enable them (due to a recent revision of the law) to ride any low powered vehicle fitted with pedals. All these novice riders had completely mastered control of this delightfully simple little machine well inside fifteen minutes, and were all surprised with the simplicity of it.

The P.C. 50 is powered by a 50 c.c. OHC 4 stroke engine, has no gears, and is fitted with an automatic clutch. Starting the machine is achieved by pressing a small lever on the handlebars (which in effect renders the engine compression to be released), the machine is then pedalled a few feet like a bicycle, the decompression lever released, and the engine bursts into life. Opening the throttle operates the centrifugal clutch and the bike pulls smoothly away. The smooth brakes when applied rapidly bring it to a halt, the clutch disengages, and the machine ticks over quietly at rest. It couldn't be simpler.

Handlebar controls are fitted out as per cycle practice. The left hand controls the rear brake lever and engine compressor, and the right the front brake lever, horn button and throttle twist grip. A rear view mirror is mounted on the handlebars as standard fitting. Lighting on the bike is very good especially the rear lamp, which is large and bright, an essential point on a slow moving machine. Set into the headlamp is a speedometer, reasonably accurate, and well illuminated when the lights are on.

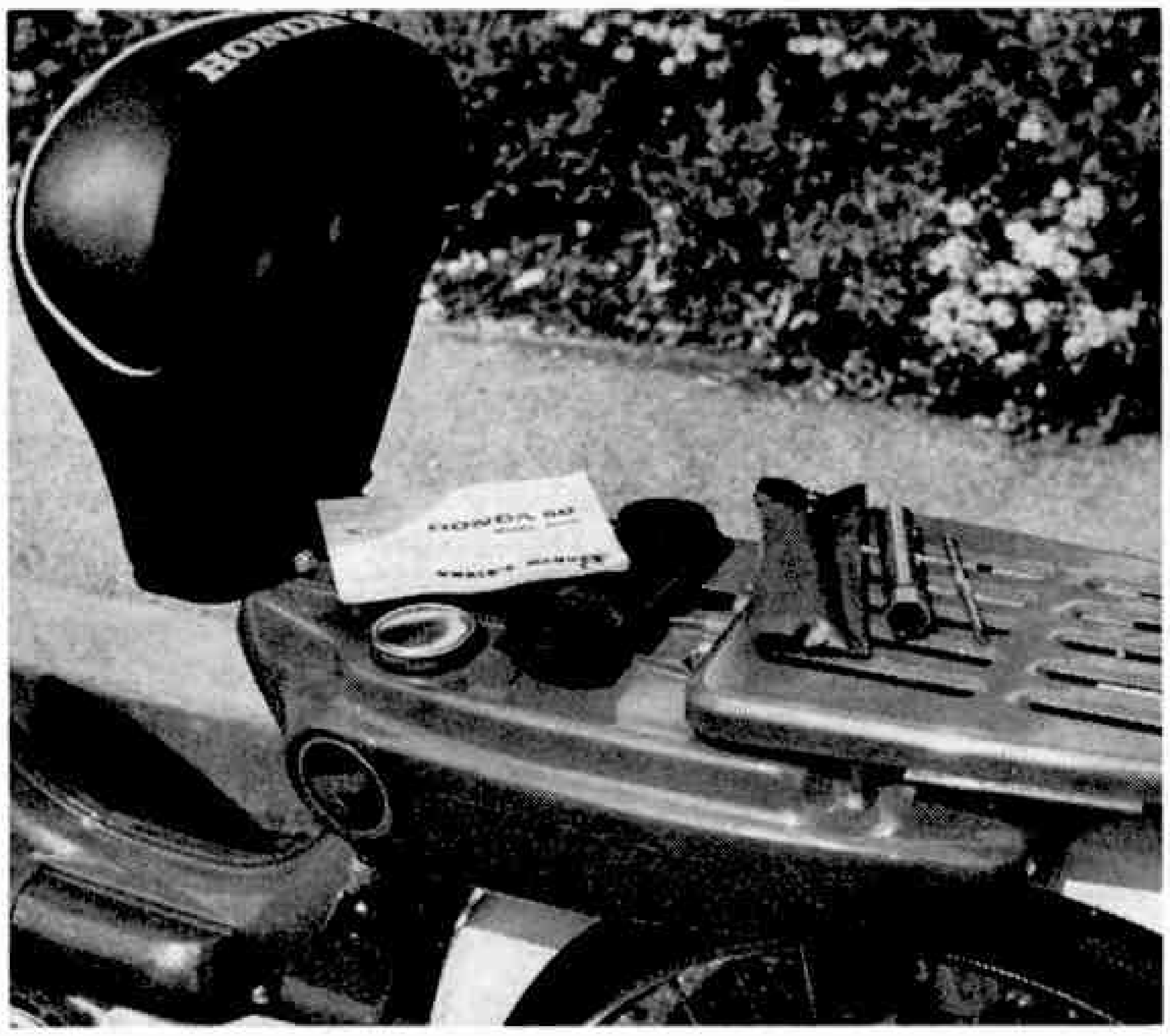
The leading link suspension coped with all but the harshest bumps and the brakes pulled it up rapidly and smoothly.

The Bodywork

The bodywork of the P.C. 50 is simple but at the same time attractive. The mudguards are well shaped and finished in a contrasting colour to the rest of the machine. The suspension is soft, and this coupled with a large well padded single seat, makes for comfortable riding. Lifting the seat reveals the fuel tank and a small tool space (tools provided with model). Behind the seat is fitted a small carrier with attachment points for luggage straps. The engine, mounted below the centre of the frame makes getting on and off a simple task. To support the machine when at rest a simple two leg stand is fitted.

The Engine

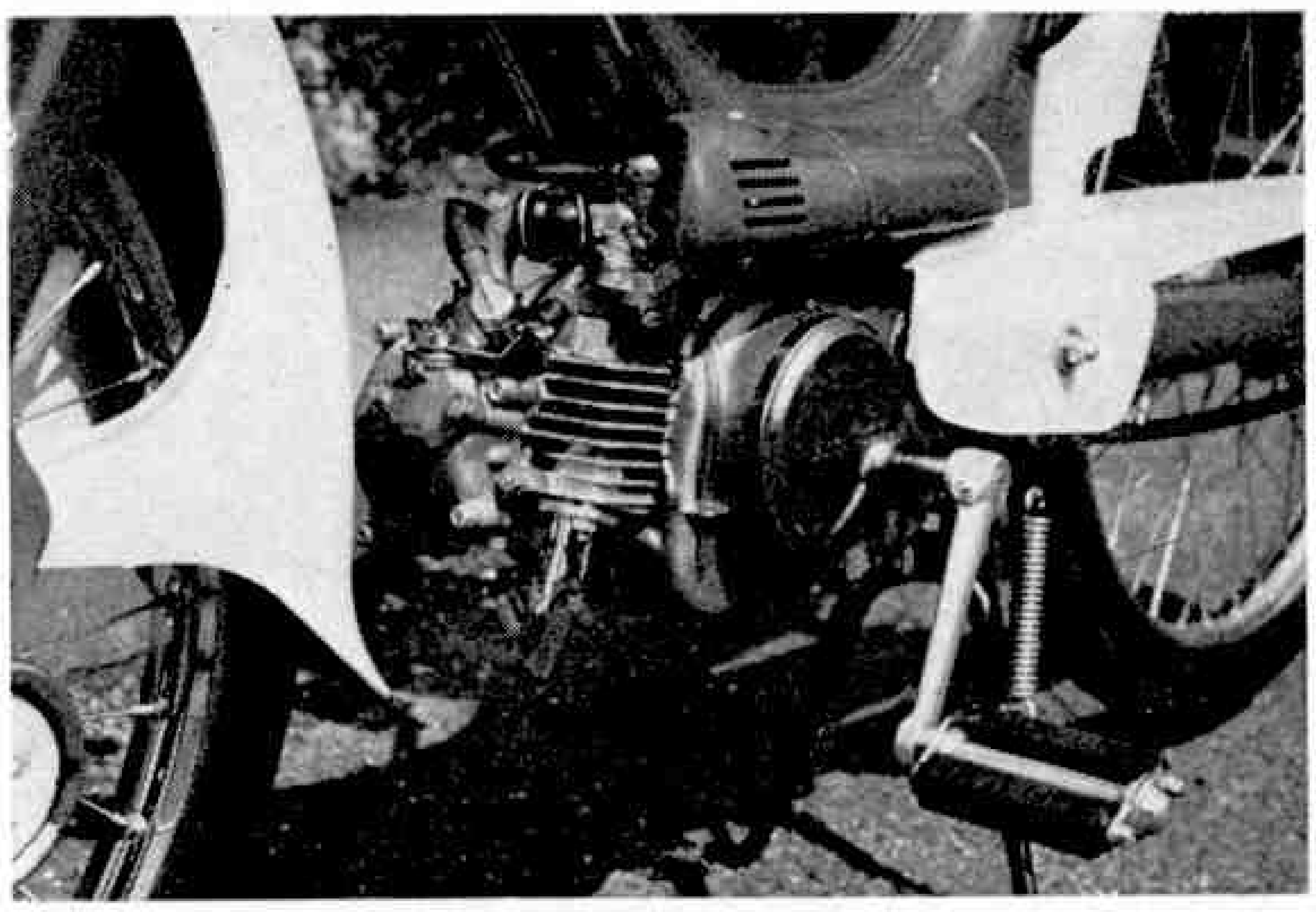
As with all the Honda range, the engine unit is a Overhead Camshaft four stroke of 50 c.c.s capacity. It starts after a short turn of the pedals and is very smooth and quiet in operation. The power produced is good to a point where under normal conditions the pedals are only required for starting the machine, we never had cause to use them at all even on hills during our test to assist the engine. Choke was needed when the engine was cold but could rapidly be dispersed with once the engine had run for a minute or so.



Two small rubber suckers hold the seat firmly in the " down " position. Underneath the instruction booklet in the above photograph is the small tool compartment housing the tools displayed on the carrier.

The Gearbox

With only a single speed there is of course very little that can be described under this heading. A very useful feature here however, is the inclusion of a small lever, which when moved, disengages the engine unit completely, allowing the machine to be pedalled like an ordinary cycle. Very useful should you run out of fuel.



Neatly tucked away below the centre frame is the smooth and powerful 4-stroke engine unit. Note the sturdy two-leg stand and the deep, flared, front mudguard.

Summary

For the beginner, this machine is ideal: simple to ride and handle, in fact it is as convenient as a bicycle and makes a good starting point into the world of two wheelers. The cost is very reasonable at £71 7s. 6d. and is certainly value for money.

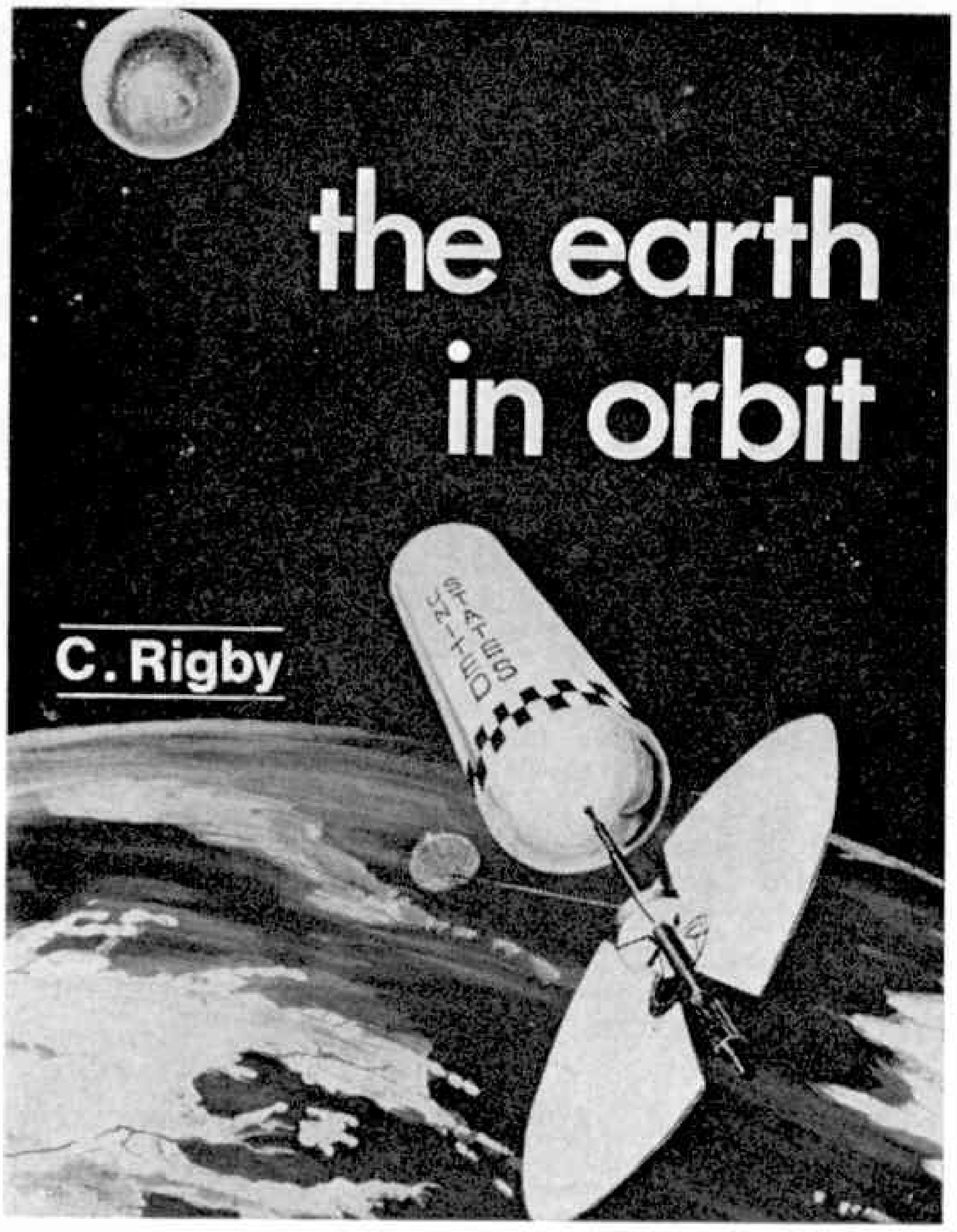
Accessories

A wide range of accessories are available for the Honda P.C. 50, including such items as a windscreen, legshields and pannier bags, all available from your local Honda dealer.

The clean and tidy lines of the PC 50 help considerably towards its overall attractive appearance.

FOR THE TECHNICALLY MINDED

Cubic capacity:	**50 c.c.s**
Maximum power:	**1.75 b.h.p. at 5,750 r.p.m.**
Consumption (per gallon)	**150 m.p.g. (approx.)**
Weight	**105 lb.**
Tyres	**Front 2.00 × 19 in.** **Rear 2.25 × 19 in.**
Lubrication	**By separate oil tank**
Common dimensions	**Length 69 in.** **Width 23.6 in.** **Height 40.6 in.**
Available colours	**Two tone Blue/White** **Red/White Grey/White**



the earth in orbit

C. Rigby

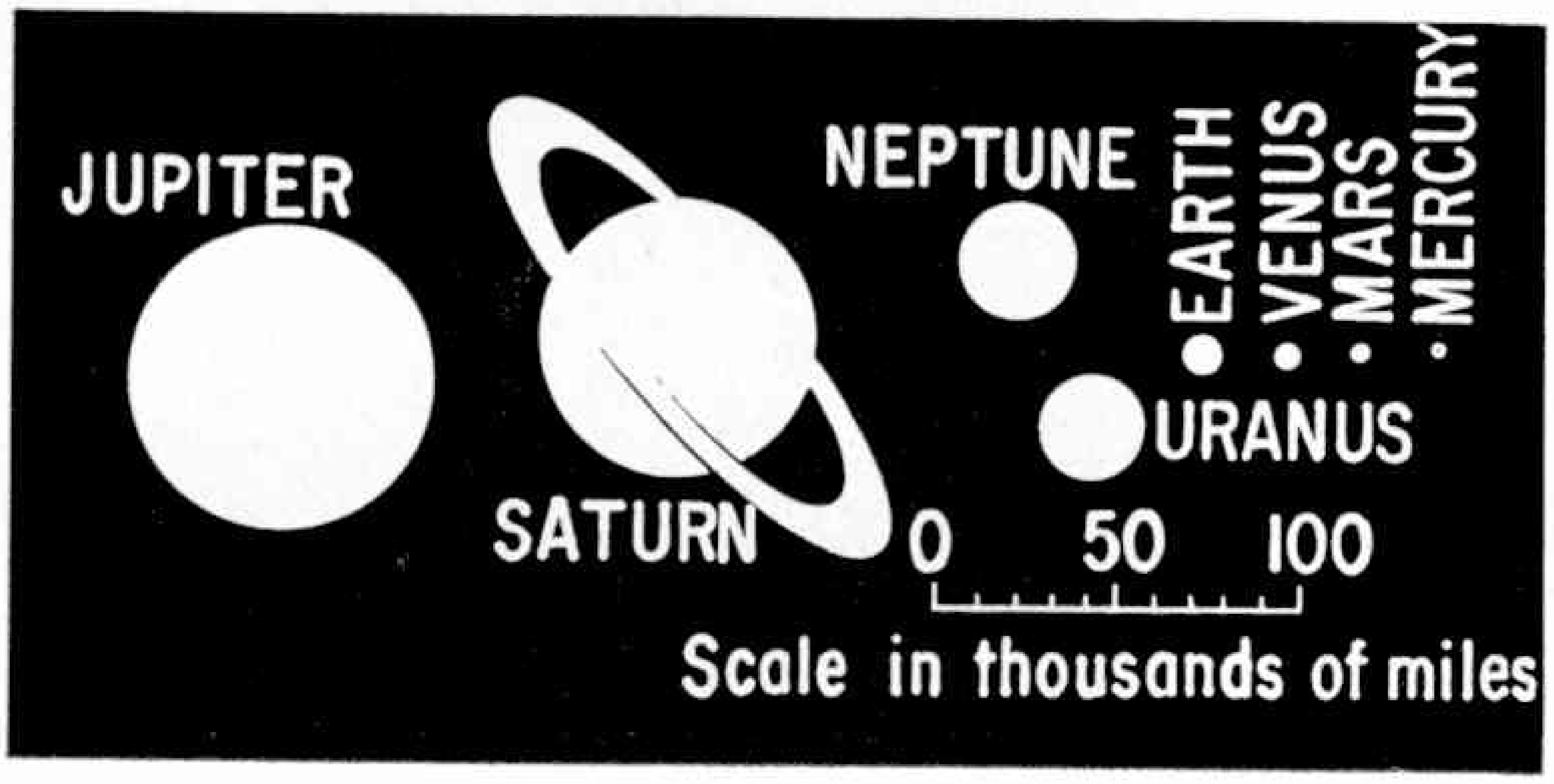
ALTHOUGH MANY people believed that the Earth was flat before the discovery of America, even then and very much earlier, it was considered a sphere by most scholars. However, they did not believe it revolved around the Sun. They thought it was in the centre of the universe, and that the Sun and other heavenly bodies revolved around it. Proof of the roundness of the Earth was recognised among the ancient Greeks, especially from observation of eclipses of the Moon. They knew that these occurred when the Moon entered the shadow of the Earth. Since they could see the edge of the Earth's shadow on the Moon, and noticed that it was always an arc of a circle, they realised that nothing but a ball could invariably cast a round shadow when illuminated from any direction.

The first recorded suggestion that the Earth and other planets revolved around the Sun is generally attributed to Aristarchus, an astronomer who lived on the Greek island of Samos about 265 BC. Most of his books have been lost, including that in which this suggestion was made. But this was known from a reference made a little later by Archimedes. However, most people continued to believe that the Earth was fixed, with the Sun and other planets revolving around it. Not until after Nicholas Capernicus revived and developed the ideas of Aristarchus in a book published in 1543, did they become generally accepted.

The movement of the planets around the Sun follows the three laws of planetary motion proposed by Kepler, a German astronomer who lived during the 17th century. The first law gives the shape of a planet's orbit, namely an ellipse with the Sun at one focus; while the second describes how the speed of the planet changes in different parts of the orbit. It moves fastest when closest to the Sun. The third law states how the time required by the planet for a complete revolution becomes longer, the farther is its average distance from the Sun. After Kepler proposed these laws, Isaac Newton developed his theory of gravitation, and showed that they follow from it.

The age of the Earth has always been a problem to geologists. It is only lately that a fairly accurate method of placing its age was evolved after experiments making use of uranium, which goes through a series of changes of which radium is one stage, ending with lead. The rate of decay is such that 100 lb. of it will yield 1 lb of lead after 70,000,000 years. This kind of lead with atoms weighing 206 units, makes up about 28% of ordinary lead. Hence, 1 lb. of uranium yields 1/100 × 100/128 lb.: or 1/28th of a pound of lead after 70,000,000 years. Where uranium and lead are found together, scientists can measure the amount of uranium and also the excess of lead 206, over the normal proportion. Since this came from radioactive decay the more there is in relation to uranium the older is the rock in which found. Hence the oldest rocks so measured were thus formed 28 × 70,000,000 years or 2,000,000,000 years approximately. Perhaps another billion years were required after the planets were formed, before these rocks solidified, so the earth's age is believed to be 3,000,000,000 years (approx.). Its mass (or weight), and that of its atmosphere, also important, have been calculated.

Geology is the science which interprets the evidence afforded by the earth's crust as to its composition, structure and ancient forms of life. The various periods and sub-periods of classifications are indications of the earth's past history, these being (1) Primary or Palaeozoic, (2) Secondary or Mesozoic, and (3) Tertiary or Cainozoic and Post-Tertiary. The coal measures formed long ago, which occur in Britain and other countries indicate the period when there were once vast forests. After many centuries, the trees died and decayed and were covered by other layers or strata. According to an Austrian geologist, Hans Hoerbiger,



Left: PLUTO, discovered in 1930 is the 9th planet of the solar system, and at a distance of 3,666,000,000 miles (approx) from the Sun is believed to be about 3,500 miles in diameter.

Right: Sketch of an old map showing where Atlantis foundered.

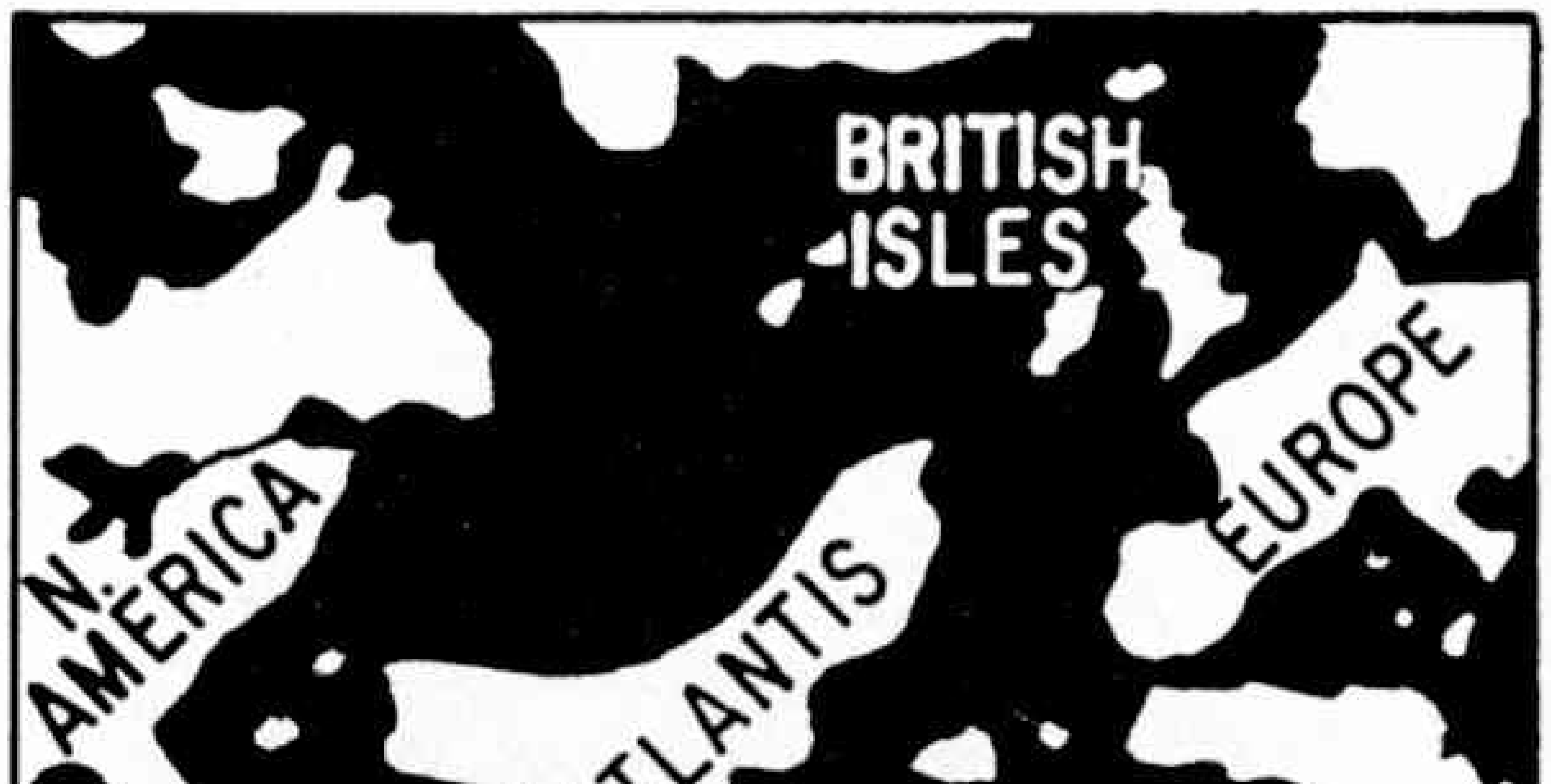
the long approach of a chain of Moons and their increasing influence over Earth is the cause of the geological epochs. This is why the dinosaurs disapeared at the end of the Mesozoic age. Hence the mystery of the mammoths, long frozen in the wastes of Siberia and other places. In 1964, for instance, the bones of two creatures, a mammoth and a straight-tusked elephant, which lived in the Thames Valley about 200,000 years ago were found in an Essex clay-pit.

The Greek philosopher Plato who lived about 400 BC. wrote about a continent named Atlantis which lay in the Atlantic Ocean, west of the Straits of Gibraltar. He told of bitter warfare between the forces of Athens and Atlantis. The latter were defeated and then in a single day and night their armies disappeared into the ground and their homeland sank beneath the sea. However, while this was purely imaginary, it is true that there was once a continent and a land-bridge in what is now the Atlantic Ocean, but how long ago it was is still a mystery. According to Hoerbiger, about 13,000 years ago, the Moon came dangerously close to Earth. At a conjunction of the two planets it was captured, then were forged gravitational ties that cannot be broken until the Moon is destroyed. A terrible struggle took place as the Moon strove to break through and its crater-pitted surface bears the scars of that strife. Atlantis, too, perished in this convulsion. Other theories have been put forward to account for its destruction.

Another point of importance about the Earth is the ' precession of the equinoxes '. This is explained as follows. In the northern hemisphere, its axis termination, the North Pole, is invariably shown pointing directly to the Pole Star, Polaris, but actually this is about one degree out—see diagram. Spinning in the same way as a top, the precession goes in the same direction as the top is spinning. With the Earth, however, precession takes place in the opposite direction to its spin of rotation. As will be noted, the North Pole is not pointing directly to the Pole Star, and in the diagram this is exaggerated to make it clearer. By the year 2,000 AD. the Earth's axis will be pointing more directly to the Pole Star, so in this interval the axis of the Earth will have changed direction in the path of a circle. The axis takes about 25,800 years to complete one full circle, during which time the constellations and astrological signs visible from each hemisphere change. According to one authority, Polaris has not always been the Pole Star, nor will it always be in the future.

Another movement, known as ' wobble ', attributed to some lack of symmetry of the Earth with respect to the axis around which it spins, is much the same sort of movement one could expect from a child's peg top if the wooden body were not firmly fixed to the metal peg. Since 1900, astronomers have found that it spins in a way that appears to be slightly indepenedent of its axis. According to them, it zig-zags around its axis to the extent of about 72 ft. every 14 months, roughly five feet a month, or two inches a day. It zig-zags as though the planet had an axis pin driven through from the North Pole to the South, but that the surrounding core material was so soft that the Earth could move irrespective of it. The amount of movement does not seem to vary much, but the direction sometimes changes so haphazardly. Observation stations have been set up in America, Russia, Japan, Italy, Sardinia and Canada, to study this problem. Regularly, astronomers in these countries have been focusing telescopes on specially selected stars and calculating by

Deceived by our eyes. Lightning strikes near the Power Line of Iowa, *Heat & Power Company, USA*. Long ago, it was generally believed that lightning strokes spurted from the sky toward earth. Now it is known that the lightning strokes spurt from the ground toward the sky, the charge built up in the clouds having travelled to the earth, invisible to the naked eye. *Photo courtesy of General Electric Company of USA.*



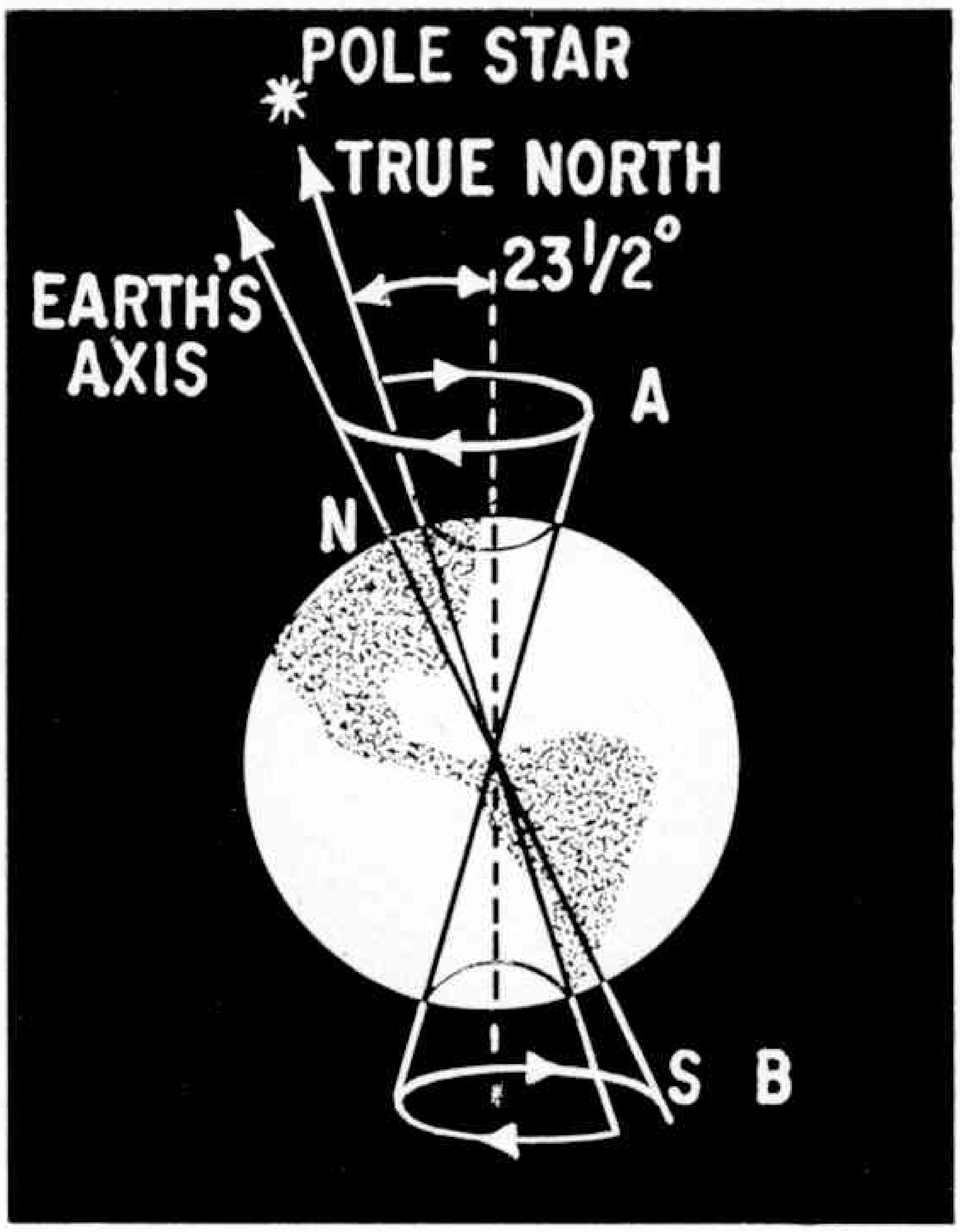


Diagram of the Earth to show precession of the equinoxes. The axis of the spinning globe describes a double cone, both north and south, as it precesses in the opposite direction to the spin of the earth. It takes nearly 25,800 years to complete one revolution (indicated at A and B in the diagram) which is exaggerated to make it clearer.

their apparent movement just what the wobble amounts to.

Several years ago, Herbert Frank Finch, in the quiet of his hill-top observatory at Abinger in Surrey, stumbled on another important astronomical discovery. By careful clock-watching he found that the Earth instead of rotating at a regular rate as scientists assumed, spins faster every autumn and slows down every spring. He got his first clue after the observatory was fitted out with more accurate quartz-crystal clocks. When he noticed the clocks were running slow one misty autumn morning, he wondered whether their reliability had been over-estimated. But when he found them running fast in the following spring he knew the Earth must be at fault.

It is believed that this rotation rythm is due to seasonal shifting of air and water as the polar ice-caps alternately melt and freeze. Through this important discovery the world's time was made more correct. Perhaps you have heard or read other strange things about our Earth, such as 'Continental Drift', a theory which various authorities have put forward. Hence the Earth has gone through many changes since it was formed about three thousand million years ago. Perhaps you can think of other strange facts and so add to your knowledge about our own planet—the Earth.

70 M.P.H. TRUCKS for SUPER HIGHWAYS . . .

described by A. Nettleton

WHAT'S NEW in the transportation of big loads today? Important changes are taking place in truck-building, so that hauliers can make full use of the super, long-distance motorways constructed in various parts of the world. Such roads are intended to be used not only by ordinary traffic, such as cars and buses, but also by specially designed super trucks carrying heavier loads than ever before. The new gigantic vehicles could, in fact, reduce the toll of the roads by being capable of travelling at 70 m.p.h. They would fit into modern road conditions by being driven as fast as other traffic, thus preventing "bunching" and reducing the frequency of overtaking. Records of serious road accidents reveal that this manoeuvre is a common cause of dangerous situations on our busy highways. The designers and manufacturers of mammoth trucks also point out that faster journeys enable a greater number of miles to be covered in any given time, thereby cutting transportation costs.

Another important outcome of recent research is more comfortable conditions for drivers of the highway leviathans. Each of these giant vehicles carry two drivers who take the wheel alternately, and the one "off duty" can adjust his seat to make it into a bed.

The latest trucks have a built-in television set as well as a radio receiver! The TV is for viewing by the resting driver, and it demonstrates the extent of the amenities being provided for long-haul truck crews nowadays. They can control the temperature in their cab and further refinements include a washing sink, a toilet, an oven for cooking or heating meals, illuminated road maps relating to the route, and a fold-away table. A Ford truck in this category has a 375 h.p.

engine capable of hauling nearly 40 tons at speeds nearing 70 miles an hour. It can keep pace with passenger cars on super highways. One of its most unusual features is the tilting cab, which can be raised to expose the engine.

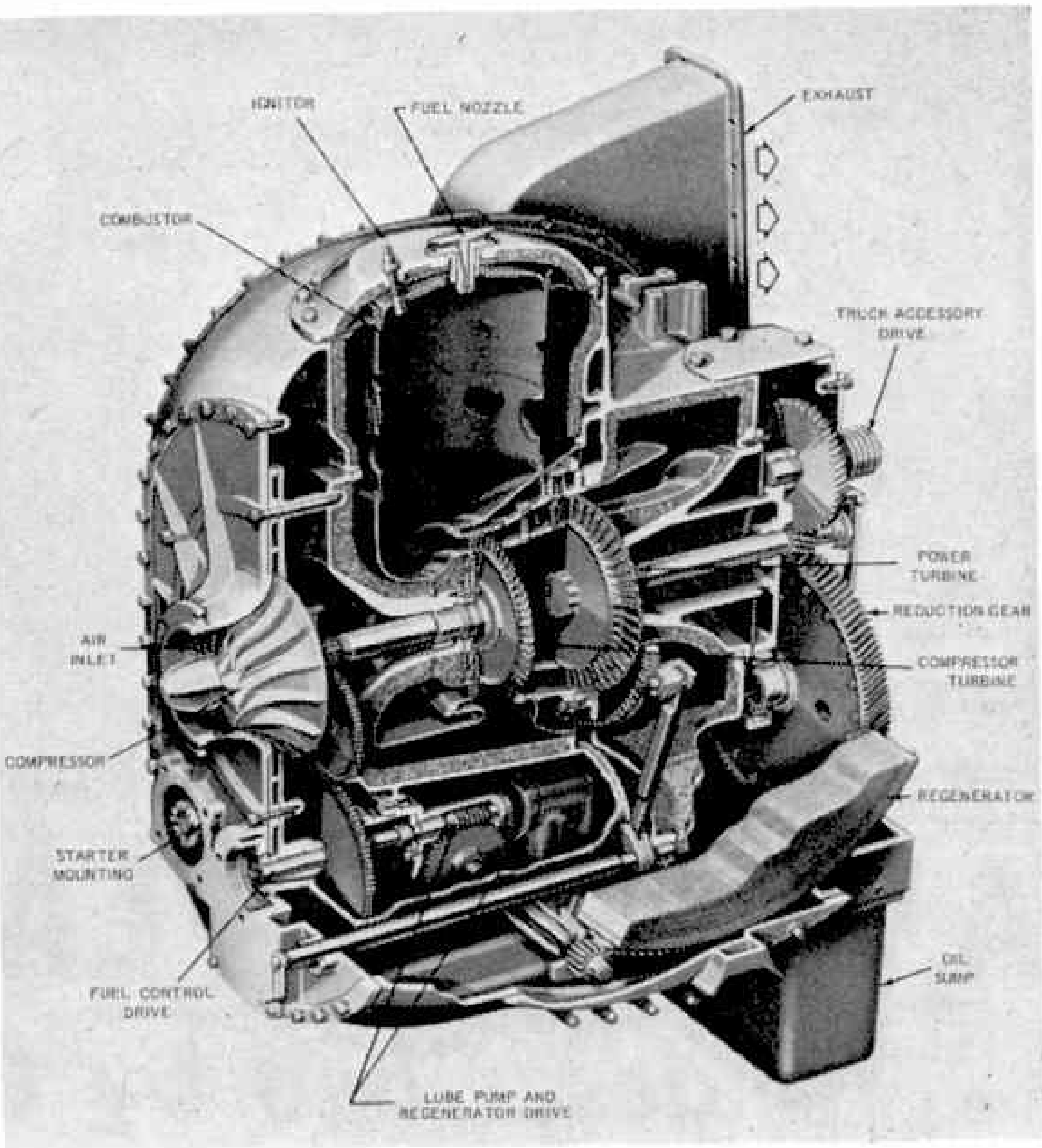
* * *

Engineers are preparing for the day, within the next ten years, when revolutionary changes are expected to occur in connection with heavy-duty, large capacity, long-haul carriers on fast-speed motorways in the U.S.A., Great Britain, and many other countries. The changes have been encouraged by the development of the gas turbine as a rival of the diesel engine. While turbine engines have been used in aircraft (" jets ") since the closing days of World War II, the application of this form of propulsion to road vehicles has lagged. One reason is that, for use by the trucking industry, turbine power has to be coupled gears and wheels instead of simple thrust. Another factor is that turbine engines operate most efficiently at full power—a characteristic undesirable in vehicular operation. The gas turbine engine is a continuous combustion source of power. Unlike conventional combustion engines, which harness the power of successive explosions of a compressed fuel-and-air mixture in the cylinders, a gas turbine compresses air continuously. The two systems differ in the fact that the essential motion of the turbine is rotary, whereas in a conventional vehicle engine the up-and-down movement of the piston has to be transformed to the rotary motion of the crankshaft. Among other advantages of the gas turbine engine is its quietness, which permits normal conversation to be heard in the cab at highway speeds. This feature, along with the lack of vibration, provides greater comfort for the drivers and influences safe driving. Organisations concerned with air pollution welcome the gas turbine, for it emits less exhaust fumes than present-day petroleum or diesel engines. Behind the development of the " jet " engine for bigger trucks is more than ten years of research at laboratories specially equipped for answering the many technical questions which have arisen.

International Harvester has been road-testing a prototype gas turbine engine in a truck chassis. The engine—50 inches long, 41 inches high, and 36 inches wide—weighs only half as much as a comparative diesel. Officials of the concern say that they are looking forward to the time when gas turbine engines are available over a wide area. Another prototype, built by the Ford Company three years ago, is expected to be on sale in the early 1970's. General Motors has designed a turbine-powered bus for experimental use. The research team aim to collect data helpful in investigating the role of turbine engines in providing rapid public transport. The test vehicle is 40 feet long, but it is constructed in 5 ft. sections, so that it can be scaled down to 35, 30, or even 25 ft. Turbine buses in populous centres would greatly reduce the noises, fumes and smells almost inseparable from the widespread use of diesel engines in public transport today.

* * *

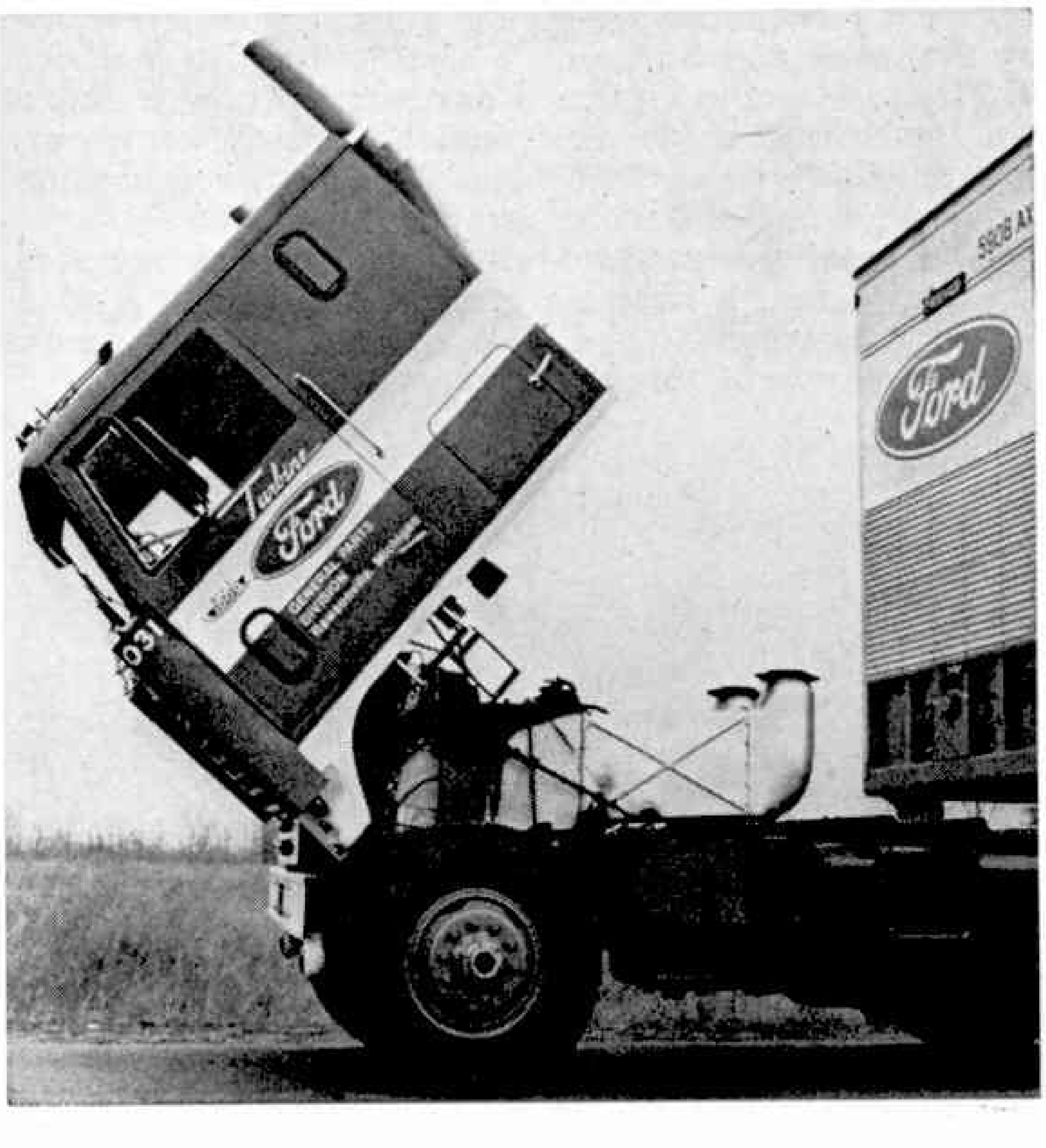
Even larger and more powerful trucks will be needed in the future, according to experts who have studied the matter. They have pointed out that there is a rapidly growing demand for vehicles which, despite their great size, can keep their place in the traffic stream. They will have to be able to climb faster, stop faster and track better. Oddly, the mammoth trucks of today have link with the pioneer days of motor transport. The first vehicle built for sale by Henry Ford was not his famous Model T, as widely assumed. He entered the transport field in 1889 by introducing a " contrivance " (as it was officially called) which pulled a horsewagon. It was used by a Detroit shoe company.

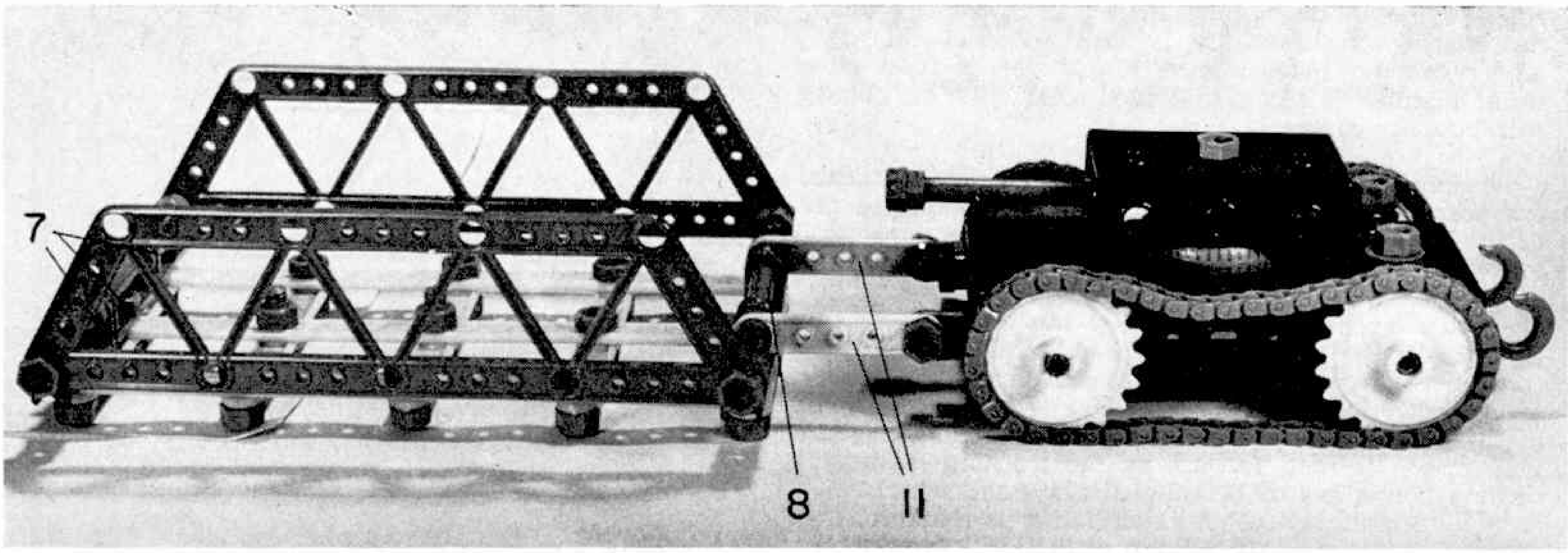


Above: Diagram of the gas turbine unit.

But it is unlikely that Ford in his most inventive mood ever envisaged monster trucks speeding at 70 miles an hour along specially built highways.

Below: Tilting Cabin—Ford Motor Company has produced a research prototype gas turbine-powered truck for heavy duty over-the-road service. Raised cabin exposes turbine engine of 375 horsepower capable of pulling 80,000 pounds (36,000 kilograms) at up to 70 miles (112 kilometers) an hour, and keeping pace with passenger car traffic on modern superhighways.





A PAIR IN PLASTIC MECCANO

described by Colin Hamilton

PLASTIC MECCANO is an ideal medium for the very young modeller anxious to " have a go " at building with Meccano, but unable to handle the many small and intricate parts contained in the standard metal Meccano system. Plastic Meccano, in fact, lives up to its " big pieces for little hands " policy, yet the fact that it is designed for young children does not mean that it can only be used for building rickety, childish models. On the contrary, any number of detailed, realistic constructions can be easily produced and two such examples—a Bulldozer and a Bridge-laying Tank—are featured in the accompanying illustrations.

Bridge-laying Tank

Coming to the Bridge-laying Tank, this was inspired by the realism of Sprocket Wheels and Chain included in Plastic Meccano Outfits. Construction is quite simple but the final effect is most realistic and the tank runs very smoothly when the bridge is in the stowed position as shown in one of the photographs.

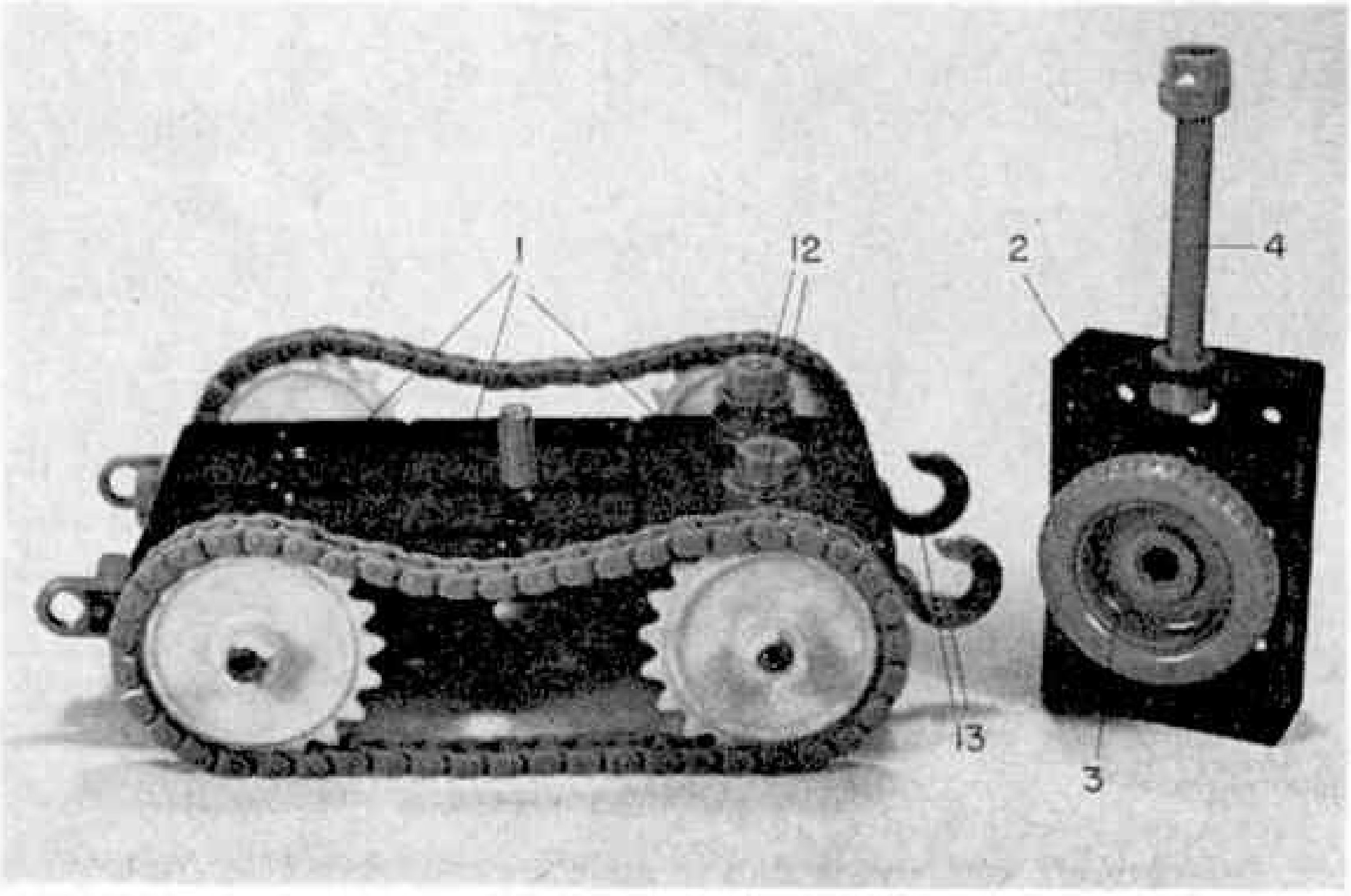
The chassis is produced from three Bases 1 bolted together, a fourth Base 2 serving as the turret. A road Wheel 3 is secured on a Bolt screwed into the centre hole in the top of this last Base, the Bolt being secured only part way in the hub of the Wheel, then the turret is mounted on a 1 in. Bolt, shank upwards, screwed into the centre hole of the centre body Base. This Bolt engages in the remainder of the hub of the Road Wheel.

In the case of the gun barrel this is made from a Shouldered Spindle 4 fitted with a pair of Nuts to act as a flash eliminator. Each track consists of 47 Chain Links running on 20-teeth Sprocket Wheels which are lock-nutted to 6 in. Axles passing through the Bases forming the tank chassis.

With regard to the bridge, this is made from three 5-hole Strips 5 connected together by five 3-hole Strips 6, each end of the bridge being fitted with three Double Angle Strips 7 bolted to the bridge base to serve as bearings for a pair of 4½ in. Axles 8 held in place by Axle Clips. These Axles act as hinge rods for the bridge-laying mechanism. Note that 1 in. Bolts 9 are used to fix the centres of the second and third 3-hole Strips to the centre 5-hole Strip. The Bridge sides are made from Bridge Girders 10, then the bridge as a whole is linked to the Tank chassis by a pair of 2-hole Strips 11, hinged to Angle Brackets

PARTS REQUIRED

2—2-hole Strips.
5—3-hole Strips.
3—5-hole Strips.
4—Bases.
28—Bolts.
3—1 in. Bolts.
32—Nuts.
2—Angle Brackets.
6—Double Angle Strips.
1—Road Wheel.
4—Pulley Wheels.
6—Axle Clips.
2—Hooks.
2—4½ in. Axles.
2—6 in. Axles.
4—20-teeth Sprocket Wheels.
94—Chain Links.
2—Bridge Girders.
1—Shouldered Spindle.



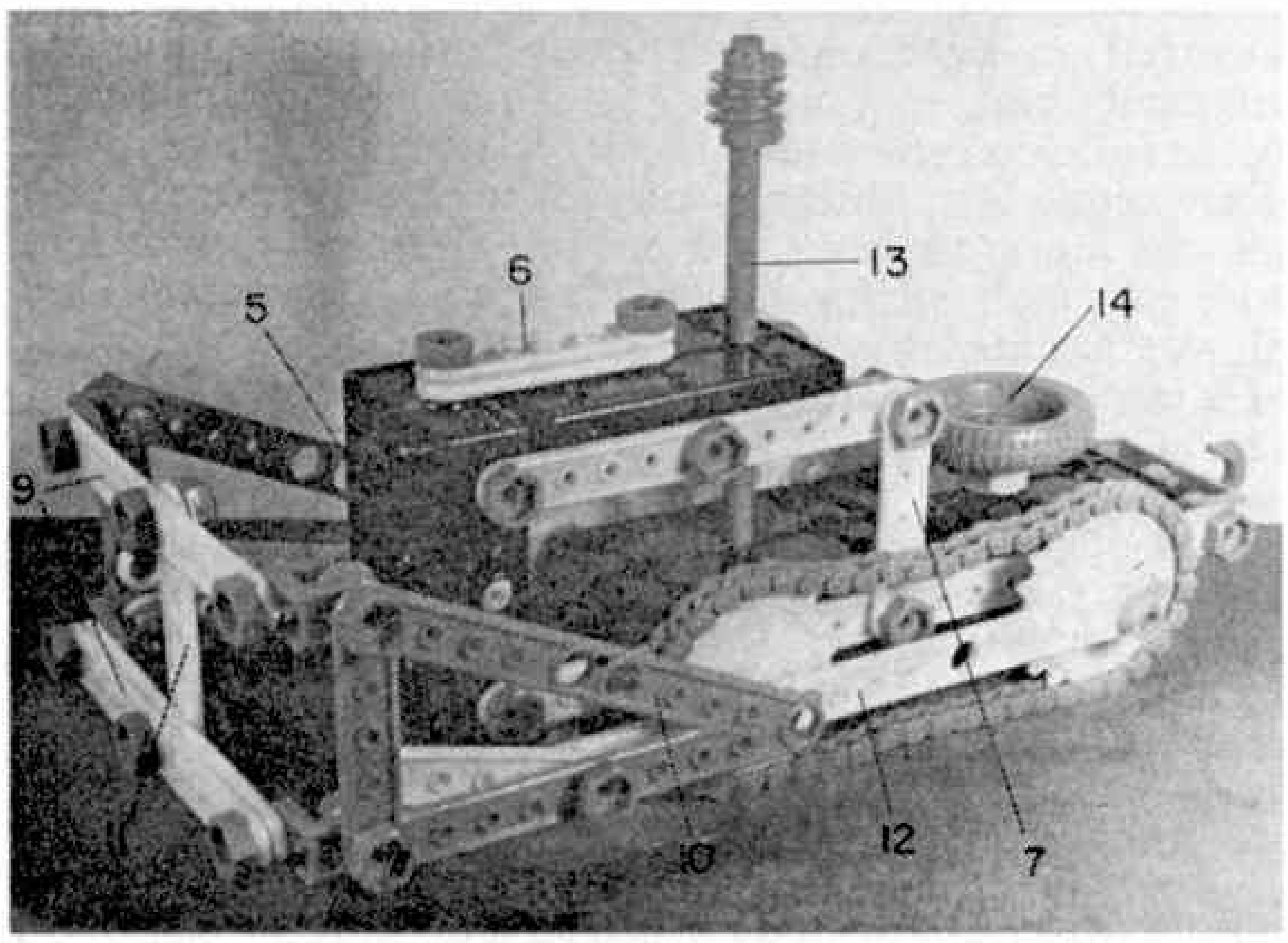
In this view of the basic Tank, the turret has been removed to show its simple method of construction. Note the 1 in. Bolt screwed into the centre hole of the middle Base.

bolted to the front of the Tank chassis. Spare track rollers made from Pulley Wheels 12, are mounted at the rear of the Tank, while two Hooks 13 at the rear end act as towing shackles to complete the model.

When moving across country, the bridge is hinged back over the top of the Tank as shown in one of the photographs, the protruding shanks of the two 1 in. Bolts 9 in the base of the bridge being located in the free holes in the top of the turret.

Bulldozer

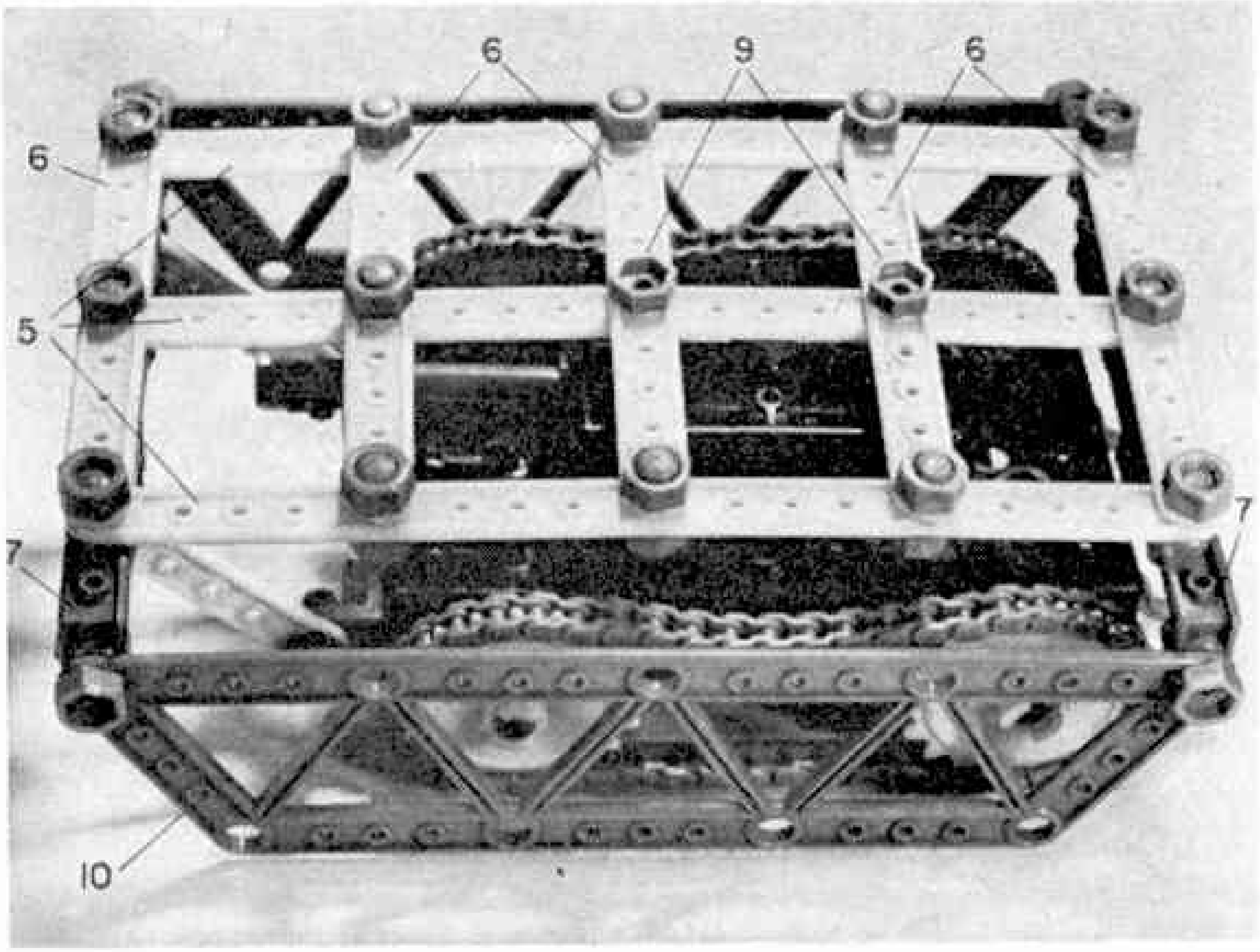
In the case of the Bulldozer, simplicity combines with realism to make a very attractive model, construction of which may be followed from the illustrations without difficulty. The chassis is formed from two Bases 1 joined together by a Nut and Bolt at the centre and then reinforced with two 5-hole Strips 2, one each side, which serve as the side members of the chassis. These are also held in place by two 6 in. Axles carrying the track wheels 3. At their forward ends, the side members are bolted to the Base unit forming the radiator and, at their rear ends, they are attached to a Double Angle Strip 4 forming the tow-bar. This is fitted with a Hook, as shown, for towing purposes.



An example of what can be done with Plastic Meccano is this amazingly realistic Bulldozer built by the author.

For the bonnet a fourth Base 5 is linked to the radiator by means of a 3-hole Strip at each side and a pair of 2-hole Strips 6 on the top. Rear supports for the bonnet are two 2-hole Strips 7 bolted to the sides of the bulldozer chassis. At their top ends they are secured to the end holes of the 3-hole Strips on the bonnet sides and they also carry a Double Angle Strip 8 forming the dashboard and final support for the bonnet top.

Each track is supplied by 47 Chain Links carried on 20-teeth Sprocket Wheels 3 secured close to the chassis sides to allow the ends of the 6 in. Axle Rods on which the Sprockets are mounted to protrude. The protruding ends of these Axles act as thrust bearings for the dozer blade. The blade itself is made from three 3-hole Strips 9 (one at the top and a double thickness at the bottom) which are in turn secured to a pair of 3-hole Triangular Girders 10 by means of four Angle Brackets. Further reinforcement is supplied at the centre by a vertical 2-hole Strip 11, while the inside members of the blade supports are 5-hole Strips 12 carried on the two 6 in. Axle Rods and held in place by Axle Clips. These are then secured by their two forward holes to the Triangular Girders but are spaced from them by 2-hole Strips to keep the 5-hole Strips parallel with the track wheels. Each of the spacing 2-hole Strips is angled slightly and rests on top of the lower Angle Brackets forming the bottom corners of the blade.



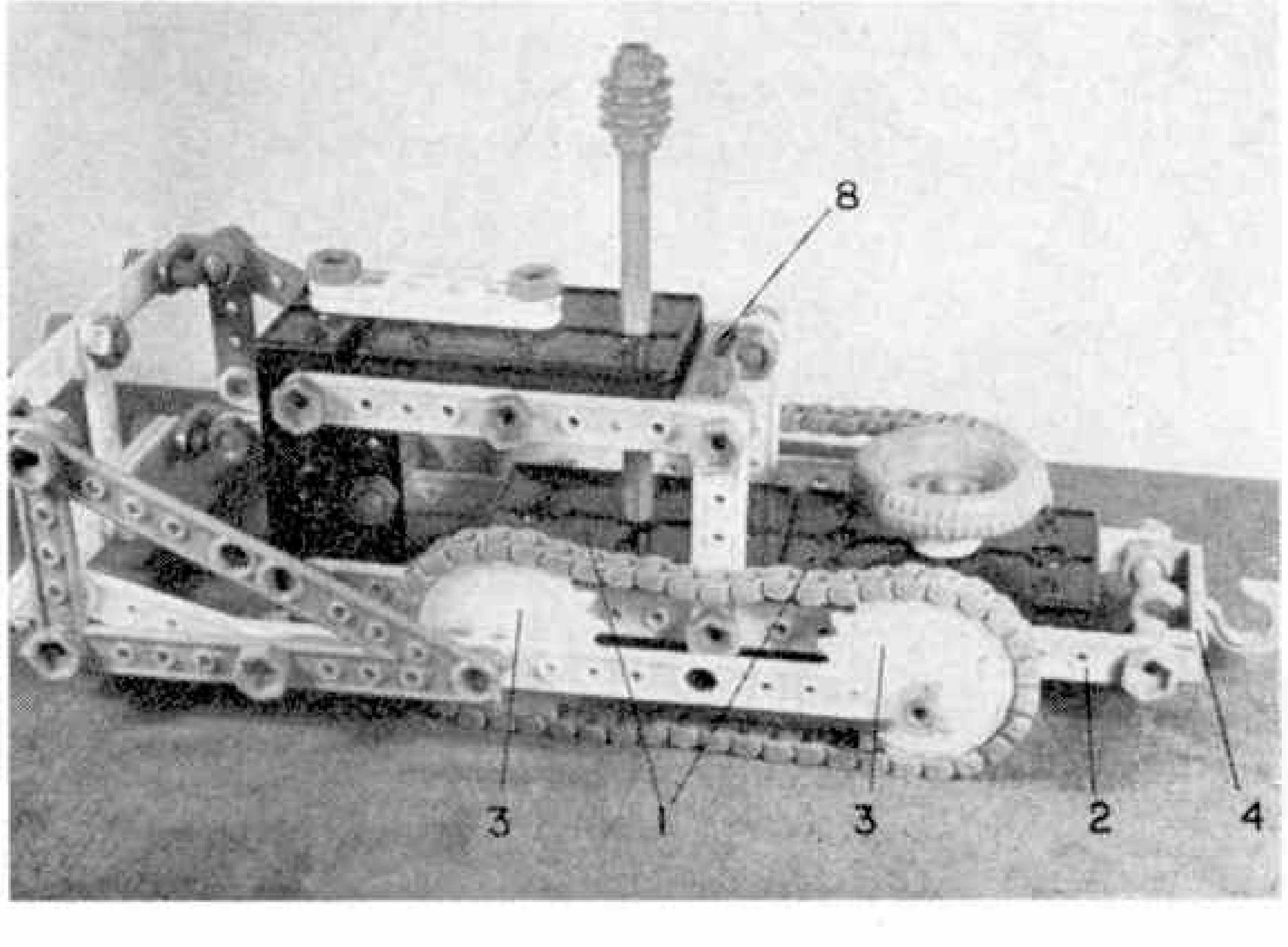
In travelling trim, the Bridge-laying Tank with the Bridge folded back and carried on the Tank, itself.

An exhaust pipe is represented by a further 6 in. Axle Rod 13 resting in the centre of the forward chassis Base and held by an Axle Clip in the end hole in the top of the bonnet Base. This is surmounted by a pair of Pulley Wheels held in place by two more Axle Clips, then a Road Wheel 14 is mounted on a 1 in. Bolt to serve as the driver's seat to complete the details. The finished model runs very smoothly over carpets, etc., with a surprisingly realistic motion.

PARTS REQUIRED

7—2-hole Strips.
5—3-hole Strips.
4—5-hole Strips.
4—Bases.
28—Bolts.
1—1 in. Bolt.
24—Nuts.
4—Angle Brackets.
2—Double Angle Strips.
1—Road Wheel.
2—Pulley Wheels.
6—Axle Clips.
1—Hook.
1—6 in. Axle.
4—20-teeth Sprocket Wheels.
94—Chain Links.
2—3-hole Triangular Girders.

Another view of the Bulldozer showing how the realistic lines have been obtained with comparatively few parts.



BREAKING THE SNOW BARRIER

by W. H. OWENS

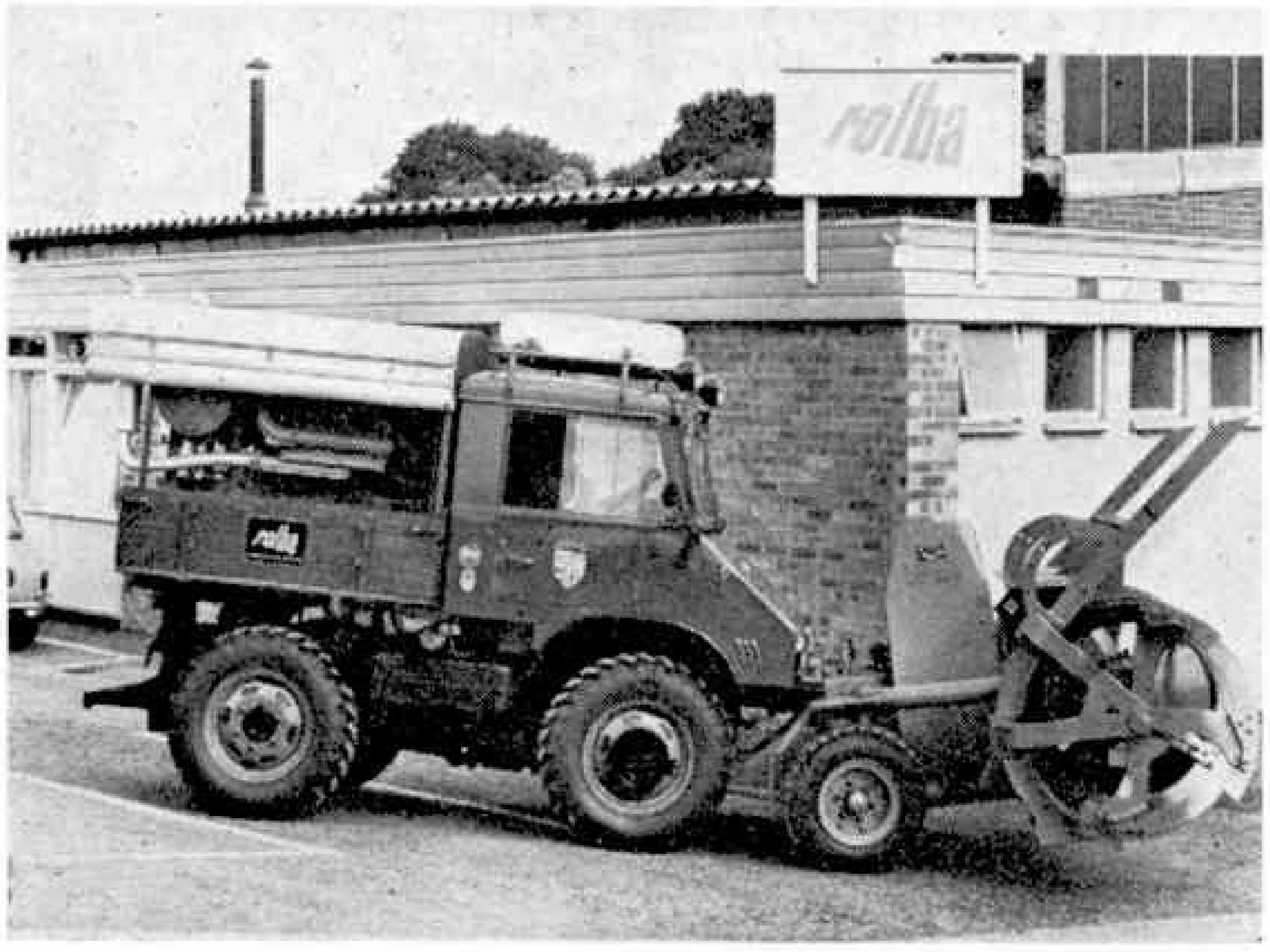
BETWEEN DECEMBER and February, spells of severe weather may be expected to disrupt and delay road, rail and air traffic over much of the British Isles. Snow blizzards, hard frost and persistent fog bring a sharp rise in road accidents. Airfields and railway services may be put out of action, and losses in industrial production caused by prolonged transport hold-ups.

So far scientists have been unable to devise any practical means to combat the menace of fog to all forms of transport, though fog dispersal experiments have been conducted on airfields. But big advances have been made in recent years with methods of clearing snow from roads, railway tracks and airport runways, and with the de-icing of traffic surfaces. Not so long ago winter blizzards in the exposed hill and moorland areas could block all the roads, sometimes for weeks at a time, because no efficient modern methods were available to clear the snowdrifts. Most deep snow removal was done, slowly and laboriously, by gangs working with hand shovels, assisted here and there with bucket loaders.

Today's ever growing volume of round-the-clock traffic on motorways and other main routes demands a very much higher standard of winter maintenance. County councils all over the country are now helped by the Ministry of Transport to keep the essential trunk roads open in the worst weather conditions. The Ministry has a network of emergency depots at key points around the country which are equipped with modern snow-fighting appliances. So in severe weather extra equipment can be dispatched from a depot to reinforce whatever is available locally in an area badly hit by blizzards.

Above: A heavy continental rotary snow blower in a Christmassy landscape on a highway in Switzerland.

Below: The latest type of rotary snow blower for winter work in Britain. The blower is detachable from the driving unit.



Ordinary bladed snowploughs play an important part in keeping roads and railway lines open where the snowfall is light or moderate. But when conditions are really bad, and high winds cause big snow pile-ups, powerful rotary "snow blower" machines take over. They work fast, shifting snow at a rate of up to 1,000 tons or more per hour and cutting a clearway eight feet wide through drifts of ten feet and upwards. One blower manned by a single operative can do the work of a large shovel gang on deep packed snow in a fraction of the time.

The great advantage of rotary snow blowers over conventional snowploughs is that they pick up and disperse the snow in a single operation. Most types of machine used on British roads are self-contained and self-powered units attached to front-end loader vehicles. As the powerful rotary blades cut into the deep-lying snow, this is forced up through the machine and blown out through a side funnel clear on to the road verge or adjacent fields. The cleared roads are thus ready for immediate gritting.

Blade ploughs and rotary ploughs can work together in keeping traffic highways continuously clear in heavy snowstorms, provided that both come into action immediately, or soon after, the snow begins to fall. The blade ploughs will push the snow into heaps at the side of the road, and these will be cleared by the blowers ejecting the snow over the verge.

Rotary snow blowers have revolutionised winter maintenance work on roads in the more severe climates of Northern and Central Europe and North America. They were originally developed for the purpose of opening up the Alpine Passes after the winter snows. Readers who have visited countries like Switzerland or Austria in summer may have noticed the heavy-duty blowers mounted on caterpillar tracks parked just off the road passes at various altitudes. To watch them at work in the springtime, cutting clearways through immense drifts of hard-packed snow is quite a thrilling spectacle. Powerful jets of snow are blown fifty feet or more into the air and clear of the roadway. Since such machines were introduced, it has been possible to open many of the high alpine roads much earlier in the year than before.

Early snow blower machines imported into Britain were very heavy and costly, and really ill-suited to the roads and winter conditions over here. Since then however, Continental machines like the world famous Swiss *Rolba* range have been modified and specially adapted. Other small and medium-sized blowers have been developed by British firms. These can be attached to any standard front-end loader or to aircraft towing tractors for airfield use.

Some of the most powerful high-capacity snow blowers are those designed specially for use at the world's international jet airports. These machines are capable of clearing more than 2,000 tons of snow hourly from runways at speeds up to 30 m.p.h. With equipment of such efficiency the time taken to remove snow from runways has been cut by as much as 75 per cent. Other high capacity blowers have been evolved for use on the railways. They are normally attached to small Diesel shunting locomotives and, while in operation, can travel up to about 20 m.p.h., throwing the snow clear of the track up to 100 feet.

In countries like Canada, where the winter is a good deal more severe and lasts much longer than in the British Isles, snow removal from city streets and urban traffic thoroughfares is a major everyday operation. Fleets of snow blowers work regularly through them according to conditions. Obviously in built-up areas snow cannot be dispersed as it is on open highways. Instead, as the snow is scooped up it is heaped directly into accompanying dispersal trucks. The ejector funnels of the blowers are specially adapted for this purpose.

On the motorways of Britain a 24-hour maintenance rota is kept at all the roadside depots in severe weather periods. Snowplough and gritter-vehicle crews are ready to go out at any time as soon as snow begins to fall. Every depot receives the hour to hour weather forecasts and special area snow and frost warnings put out by the Meteorological Office.

Much improved types of automatic gritter vehicles have been developed for fast work on motorways and trunk roads. These spread grit or salt evenly across the entire width of a carriageway at a single pass while travelling at speeds up to 30 m.p.h. The vehicles are designed also for rapid and easy loading from roadside storage hoppers and have a large carrying capacity.

Anti-snow fencing is used on many main roads in Scotland, Northern England, East Kent and elsewhere, where the routes are particularly exposed to winter blizzards and deep drifting is likely to occur. Kept in good repair through the spring and summer, such fencing has proved effective in keeping stretches of busy highways open for at least single-line traffic on winter days when they would have been entirely closed otherwise.

Large numbers of winter road accidents occur on icy surfaces which cannot always be gritted in time. To overcome the menace of ice at known danger spots, the Road Research Laboratory devised a method of road heating which is now being widely used. Grids of electrical heating cables, connected to the power mains, are laid just beneath the top surfacing. With a surface temperature detector and thermostatic control, the heating is automatically switched on whenever the air temperature falls towards zero. Consequently ice can never form and snow melts as it touches the road.

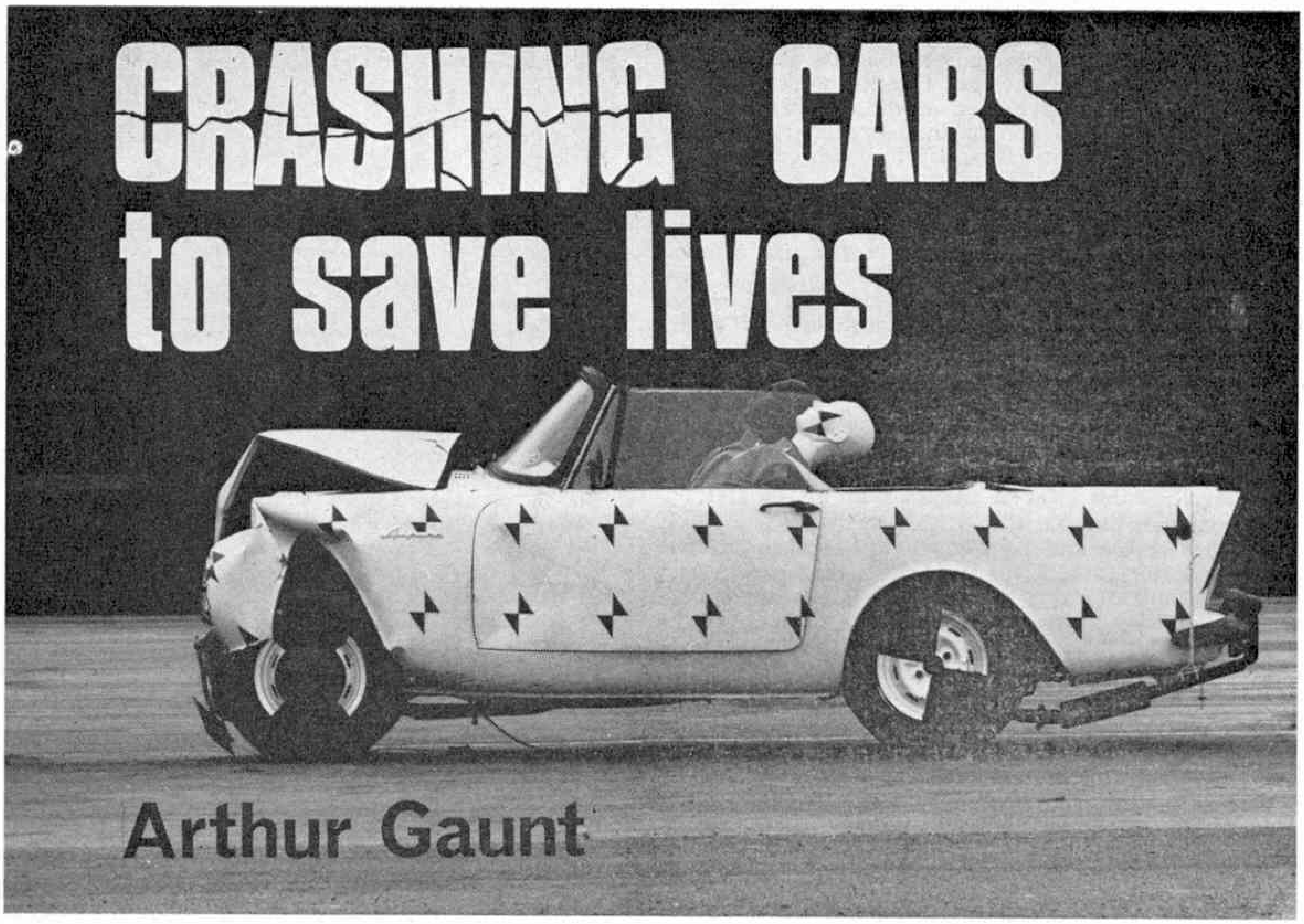
Road heating installations have been laid with excellent results on dangerously steep hills in towns and cities, at busy crossings and interchanges, major bridge approaches, on flyovers and so on. In many cases road accidents in winter have been substantially cut. Similar heating cables are incorporated in the outdoor ramps of multi-storey car parks to keep them free of snow and ice.

Above: Cutting or blowing through waist deep snow on the hillside in the Lake District with the pedestrian operated *Rolba Snow-Boy*.

Above: BICC *Panelec* road heating cables being installed in the area of the toll booths on the South end of the new Forth Road Bridge. This electrical installation involved over 50 miles of *Panelec* cables with a total rating of nearly 1400 kW. Work was carried out by Wm. Allan Smith & Co. Ltd., Electrical and Mechanical Engineers, Edinburgh; Mott, Hay & Anderson were the Consultants.

Below: This photograph shows how the rotary blower plough cuts cleanly through deep lying snow.

CRASHING CARS to save lives



Arthur Gaunt

....describing the testing of cars and roadside equipment to destruction, ensuring that maximum protection of road users is achieved....

RUNNING CARS into walls, lamp-posts, and other obstacles may seem an odd activity, yet it is one of the ways in which motoring is made safe. Data obtained from such crashes reveals what happens when car occupants are involved in accidents, and it provides scientific information useful to car designers in their search for safer vehicles. Test tracks of this sort have been established in a number of countries, by both Government departments and by private concerns. One of the most important centres is the Road Research Laboratory at Crowthorne, near Wokingham, Berkshire. It was opened in June, 1967, and has a research track in the form of a figure eight.

Road safety experiments there have included crashing cars at speed into concrete barriers placed across the track. Instruments aboard the vehicle, together with cinematograph records of the crash, enable experts to find out exactly how large are the impact forces in a head-on collision. The tests also reveal the kind of damage done to the car and the type of injuries likely to be sustained by its occupants. Dummies representing

Above: In staged road accidents, dummies provide useful information to car designers, enabling safety measures to be incorporated in new models.
Left: Even when a break-away lighting column falls on to a car, it is unlikely to cause serious injury to the occupants or damage the car to more than a limited degree.

the driver and passengers are fitted with different kinds of safety harness, so that the most efficient ones can be scientifically disclosed.

Another line of investigation concerns lamp-posts and the hazards they present to motorists. Research has also been carried out by simulating accidents in which a car leaves the road and hits a safety barrier. By no means all styles of barrier are effective in saving motorists from injury. Staged road mishaps have proved that some types actually increase the likelihood of a serious accident, rather than reduce the danger, by rebounding cars back into the traffic stream. Thanks to scientifically controlled tests, improved barriers have been designed. They bring a vehicle to rest with the minimum of damage, and without deflecting it into the path of other traffic.

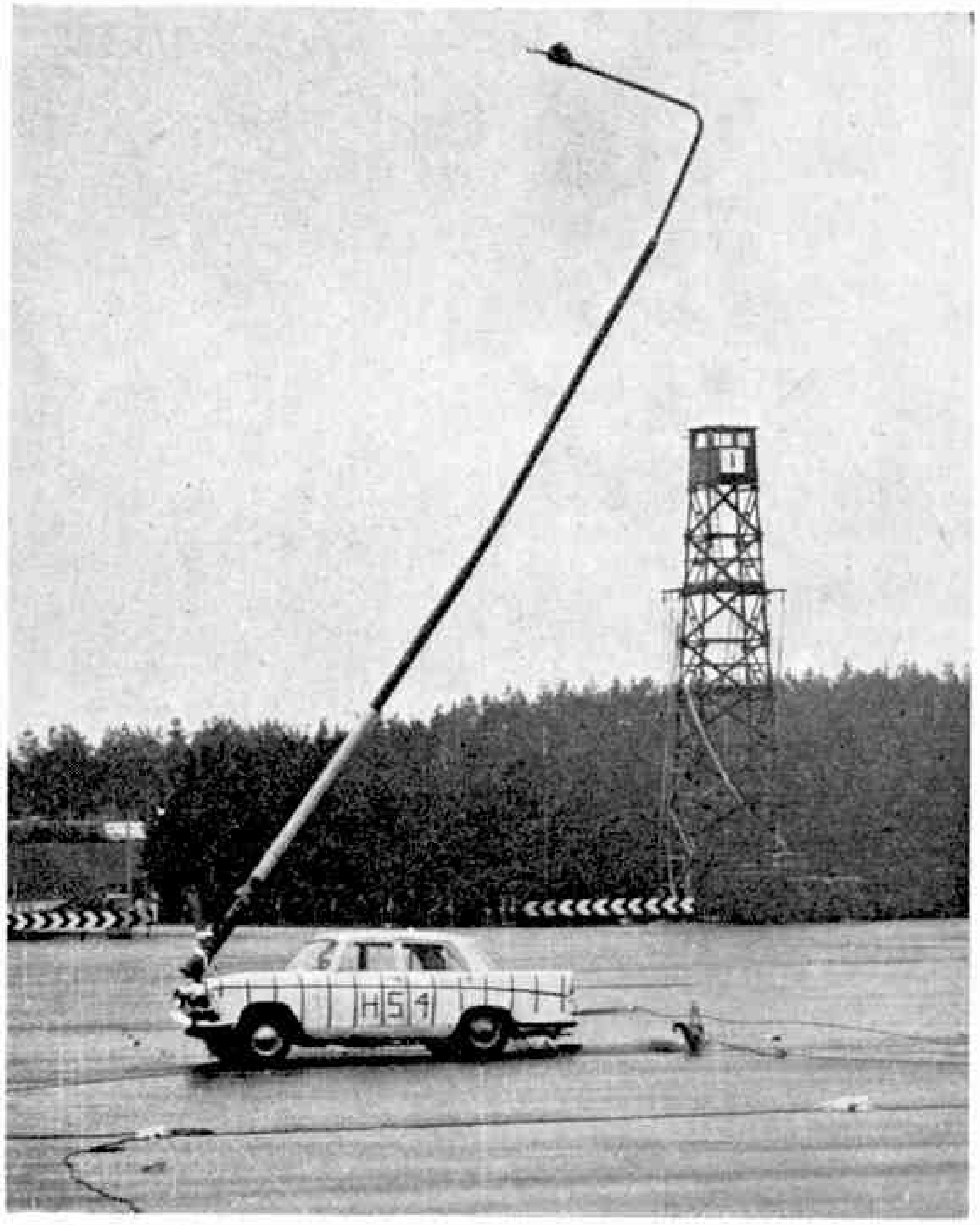
How are the cars driven when taking part in these experimental operations? In the early days of such research, the test cars were towed, or driven in the normal way by drivers who jumped out just before the moment of impact. Today the test vehicles may be manoeuvred by remote control, using radio or cables. An alternative arrangement, used on the Crowthorne track, is to push the test car with another one fitted with a large resilient bumper. When the test vehicle is rolling at about 20 m.p.h., the engine throttle is opened by means of a wire, so that the crash car then accelerates under its own power. Steering is done by a third car, which travels behind and slightly to one side of the crash car. At the same time an attachment links the steering-wheel movements in the accompanying car to those of the crash vehicle, so that they act together. Radio control is also used to make driverless cars swerve into obstacles. A further system is to run the cars along a rail, with a shoe underneath to keep them on course.

A college in New York has set up a programme of studies to learn more about the effects of car crashes without using an outdoor track and destroying cars in each experiment. The research is undertaken in an indoor laboratory. Gneral Motors perform crash tests indoors, using an " impact sledge " at controlled speeds. A battery of overhead lights provide enough illumination for high-speed photography to record the details at the moment of impact. At the University of California, scientists view such movie films projected in slow motion. They study each movement of cars and dummies before, during, and immediately after the crash.

The split-second events that occur in a car accident are being recreated in a special laboratory at Chelsea, Michigan, U.S.A., so that the features of car interiors can be designed with safety in mind.

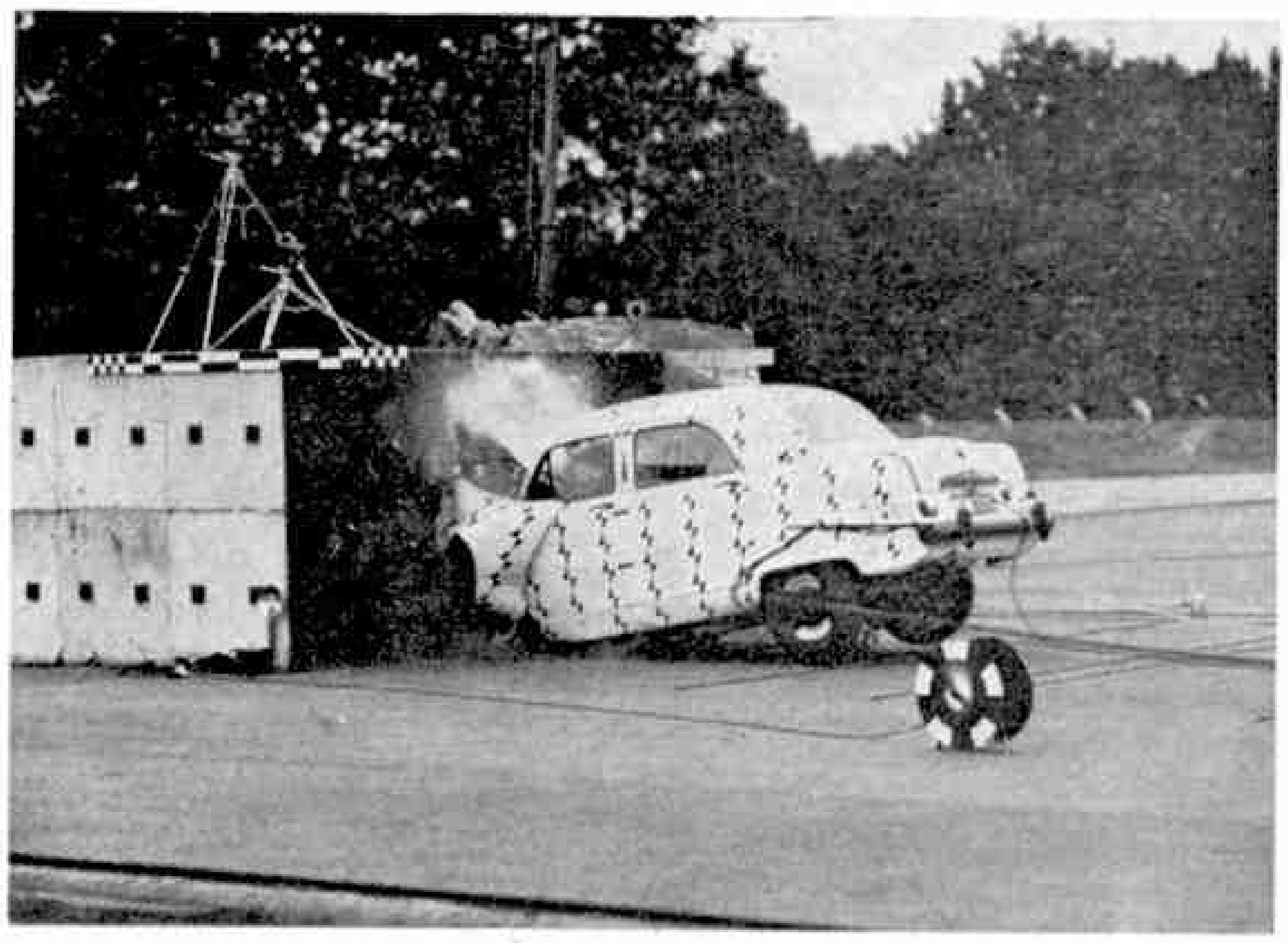
The laboratory contains a sled that accelerates experimental car bodies and test dummies along a rail 140 ft. long. High-speed motion picture cameras record what happens to car occupants in the so-called " second impact "—the impact of the occupants with car's interior. To capture this action on film, the cameras shoot the tests at the rate of 1,000 frames per second. Each frame is later projected on to a screen for analysis, and the precise measurements of the test dummies' movements can be made. The data goes to a computor, and the results help car designers to provide engineers with information enabling safer car interiors to be constructed. It may mean re-positioning some of the accessories, so that they do not cause injuries in a crash, or re-designing the instrument panel so that it has no projections that could harm the motorists. The simulator itself incorporates many safety devices for the protection of those working around it. Electric eyes sense anyone wandering into the area where the simulator is housed. The system is then automatically shut down. Other alarm systems de-activate the sled when anybody inadvertently enters the area at the far end of the rail system.

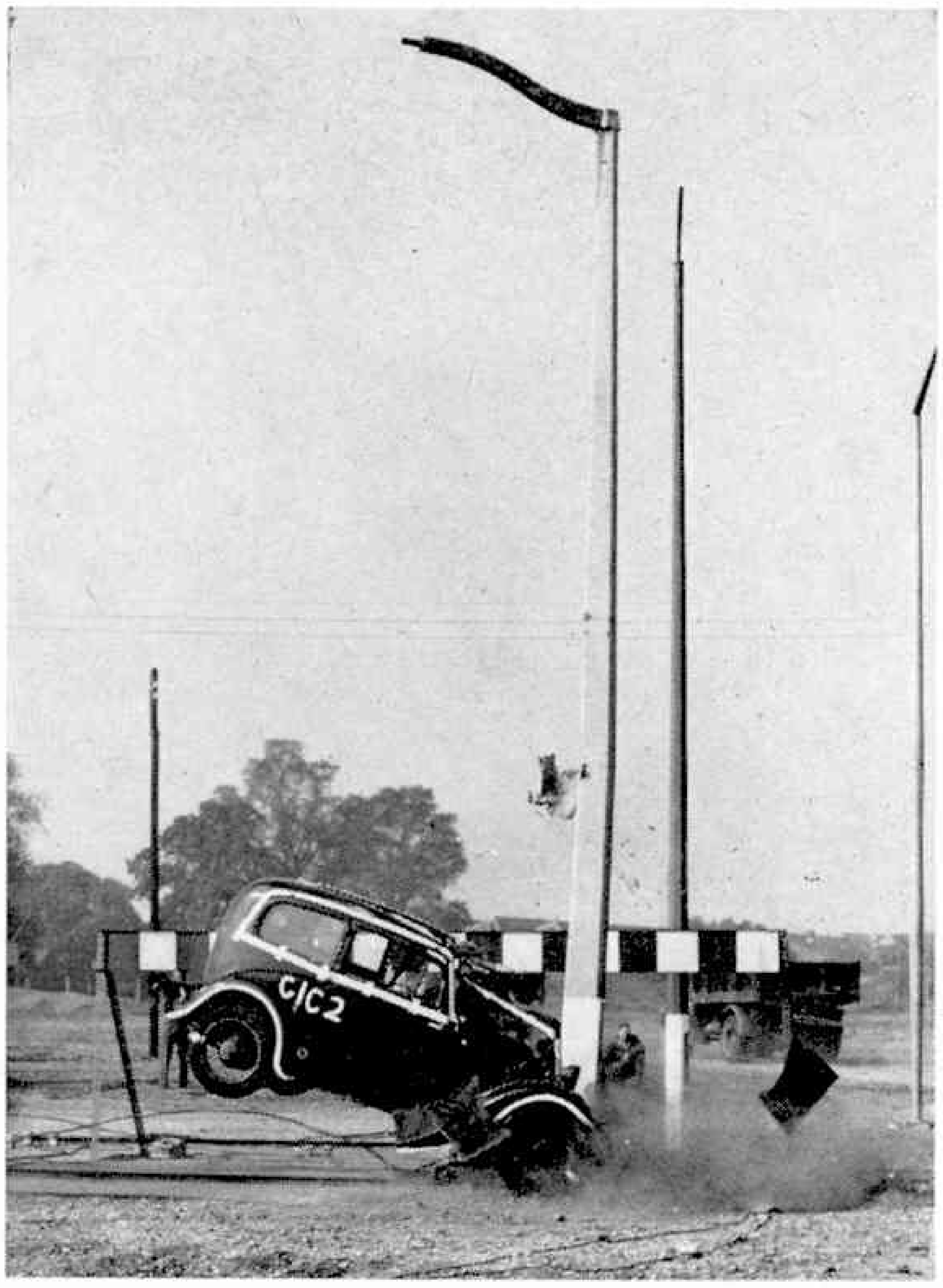
In Britain, tests with lighting pillars have resulted in ways of making them less dangerous to motorists. Collisions with these items of " street furniture " (as they are sometimes called) account for a large number of fatal road accidents each year. Highway authorities have therefore been experimenting with several means



Lighting columns which shear off at the base have been tested by the Ministry of Transport, at the Road Research Laboratory, Crowthorne, Berks. In the trial seen in progress in this picture, a car was driven into a column 40 ft. high at 60 m.p.h. yet the vehicle suffered only minor damage.

Externally controlled cars are being crashed into walls and other obstacles at Crowthorne, Berkshire, to find out how drivers and passengers can be protected in accidents.





Above: Impact experiments like this have shown the damage caused by collision with concrete lamp columns. A collision with a light-weight column which shears off on impact so as to reduce the damage to the vehicle and its occupants is being demonstrated at Crowthorne.

of minimising the dangers. Their first task was to find a pillar strong enough to support the lamp and withstand high winds. At the same time it had to be one which would break when struck by a vehicle. One type which has come through tests successfully incorporates a slip-joint at the base and is fitted with a hinged joint 7 ft. above the ground. This is made by cutting partially through the post. But as this weakens the post to such a degree that it might snap in a gale, a metal plate is bolted over the cut. The plate is strong enough to withstand high winds, but it breaks if a vehicle hits the column. In such an event the post is also jarred free from its base. In consequence the column moves over the vehicle without doing much damage. Tests have shown that a 60 m.p.h. car can strike a post of this type without sustaining serious damage. Usually only the bumper, radiator grill, and bonnet suffer. A car which brakes to 20 m.p.h. before colliding with one of these posts is often able to get clear before the column falls away.

Exhaustive research into this particular aspect of safer motoring has been undertaken at the Road Research Laboratory, Berkshire, already described. One problem was the possibility of motorists being electrocuted by live leads in a lamp standard which has been knocked down. To overcome this danger, a device for automatically disconnecting the electricity supply can now be fitted. One arrangement consists of a water proof plug inserted into a shielded socket on the top of an electrical termination box, clipped into the base of the column. The plug, attached by chains to the base-board of the shaft, is jerked out of the socket when the base and the shaft are separated by a crashing car. Another form of electrical disconnecting device is made of moulded rubber in the form of a plug. In a collision the plug is automatically withdrawn, and the live socket is made safe by an internal spring arrangement which disconnects the socket from the main supply.

Below left: Crash barriers can actually increase the hazard of motoring, by rebounding cars back into the traffic lanes, where they are a menace to other road-users. But less dangerous barriers are now available, thanks to simulated accidents.

Highway signs, though fewer in number than lighting pillars, constitute similar hazards. Hit by a car, they may crash through the windscreen and cause serious injuries. An answer to this danger is to adopt the breakaway principle for them, too, so that when struck they soar up and away, catapulting over the car instead of through the windscreen. The usefulness of this safety idea has been tested on motorways in America and elsewhere by crashing cars into roadsigns.

Simulated road accidents have proved the value of fitting "head restraints" (often wrongly called head rests) on top of the front seats of cars. They support the head, not just the neck, in case of an impact, and are designed to afford more protection from whiplash and other possible neck injuries occurring in rear-end collisions, such as "concertina" pile-ups on motorways.

The Crowthorne establishment is the biggest road research laboratory in the world. The premises, comprising some 200 individual laboratories as well as a research track in the form of a figure eight, have a staff of 800 and an annual budget of more than £2 million. The importance of this centre for road safety research, where car crashing is a part of the routine, is acknowledged all over the globe. Road Research Laboratory publications go to nearly every part of the world, for information obtained by deliberately crashing cars in Berkshire may have application to road safety in far distant countries.

TRANSPORT TOPICS

by
Mike Rickett

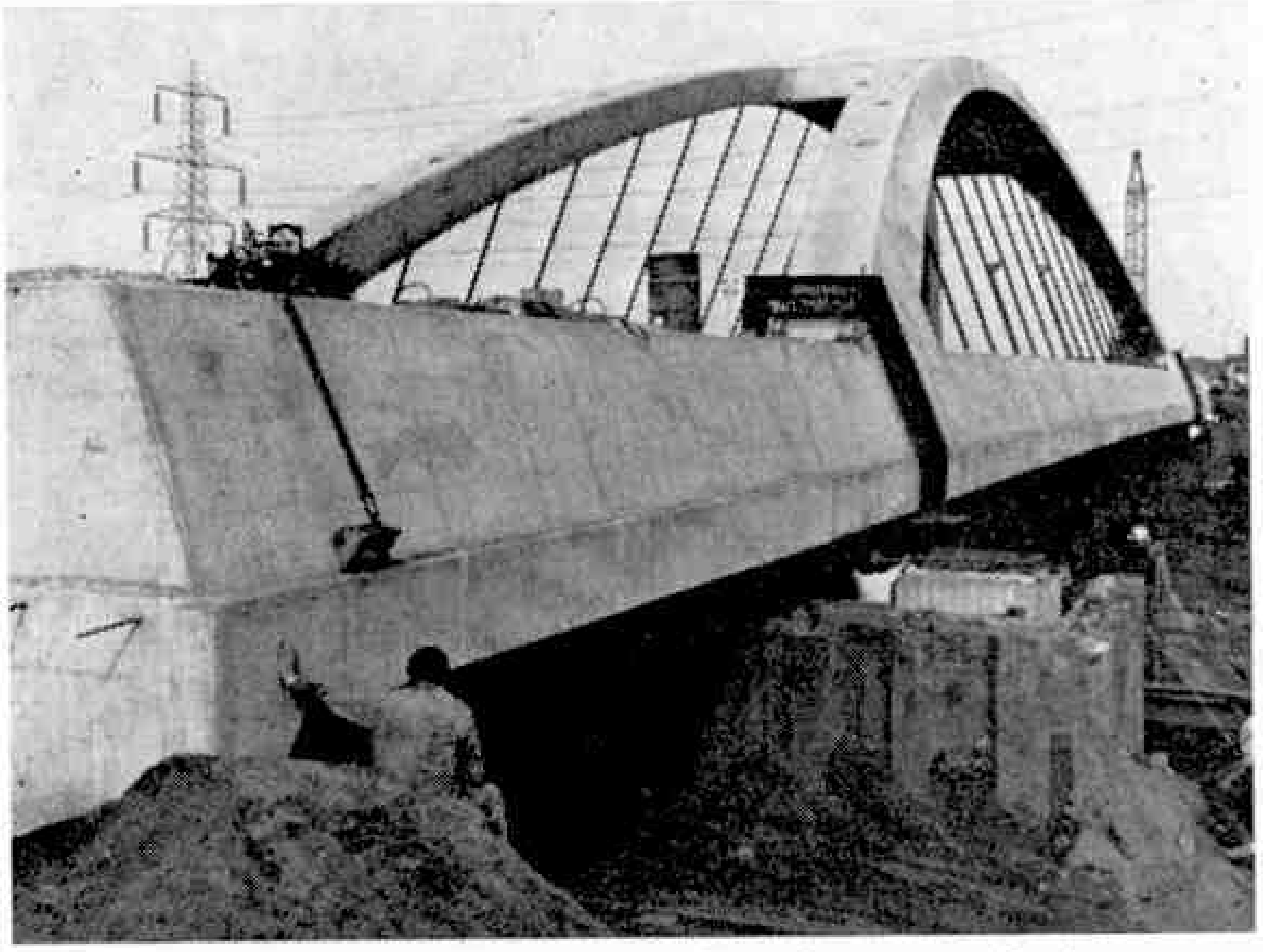
DIRT IS flying, mechanised spike hammers beat a steady staccato and the rumble of diesel locomotives and construction machinery echoes across the countryside. All this is happening North West of Columbus in the U.S.A. as the Pennsylvania Central Railroad's new $26 million automated freight yard takes shape.

Located near suburban Hilliard, the 460 acre yard is scheduled for completion by the end of this year and many phases of construction are already complete. This includes all the drainage and grading in the main yard area and thirty-two of the 80 miles of yard track have been installed with high speed track-laying machinery. All the track is of the welded rail type and over 220,000 rail ties—we know them as sleepers in this country—were needed for the new yard.

Claimed to be one of the most modern rail yards in the world, it will have a high speed, computerised 40-track freight classification section to expedite freight car switching—shunting to us—and a 128-car auxiliary yard for local traffic will speed service to Columbus and Ohio area shippers. The new yard will be equipped with a ten track receiving section and eight track departure area, diesel engine shop with fuelling and sanding facilities, freight car repair shop and car cleaning tracks.

From one of the largest freight yards in the world we heard recently about Europe's largest and heaviest concrete single span rail bridge being installed on the Runcorn to Frodsham line of the London Midland Region of British Rail. The new bridge which was slid into position on the 10th August, carries the Runcorn to Frodsham line over the M.56 motorway due for completion at the end of 1970.

For the technically minded, the bridge weighs over 4,000 tons, and is a reinforced concrete tied arch supporting a pre-stressed concrete deck via mild steel hangars with simply supported end spans. It is a type of bridge thought to be unique in Europe. Certainly the method of moving the bridge in position was unique, for British Rail used a non-stick "frying pan" surface to help move the massive bridge into position. Built adjacent to the tracks at Frodsham, which at this point runs on a 30 ft. high embankment, the bridge was slid cross-wise into the rail position on four stainless steel rails on massive 40-ton beams. In the centre of the bridge was the non-stick "frying pan" surface—a P.T.F.E. compound.



Yet another new innovation for B.R. was a special service that came into operation for the daily transfer of molten iron from Teesside to North West Durham, when three specially designed torpedo cars left Cargo Fleet Works, Middlesbrough, on the 63 mile rail journey to Consett Works—the first time that hot metal has been carried any appreciable distance over British Rail track in the U.K. The Iron and Steel Division of the British Steel Corporation's Northern and Tubes Group planned the project, in close co-operation with British Rail, to provide the iron needed to maintain steel production whilst blastfurnaces are under rebuild.

Loaded trains travel at a maximum speed of 20 m.p.h. and take a route via Stockton, Ferryhill, Leamside, Pelaw, Gateshead and Beamish. Eventually, it is proposed to operate a twice daily service of three car trains seven days a week on a twelve hour cycle. The timing and scheduling is arranged to suit both train movements and blastfurnace tapping times.

We also had news recently that the Brazilian Government has ordered two "O" class submarines of the latest type from Britain. Worth £11 million, the contract is the result of discussions regarding the re-equipment of the Brazilian Navy, who have inspected a variety of submarine designs available from the world's navies and shipbuilders. They finally chose the Royal Navy's Oberon class, the very latest in diesel electric submarines. Thirteen of these are in commission with the Royal Navy and the first versions of the craft were ordered as long ago as the late 1950's and completed in the early 1960's. Later versions followed and H.M.S. Onyx was completed in 1967. These British boat designs have been accepted by the Royal Australian Navy, due to take delivery of its fourth, and also by the Royal Canadian Navy, due to take delivery of its third this year.

Above: Still under construction, British Rail's new bridge on the Runcorn to Frodsham line.

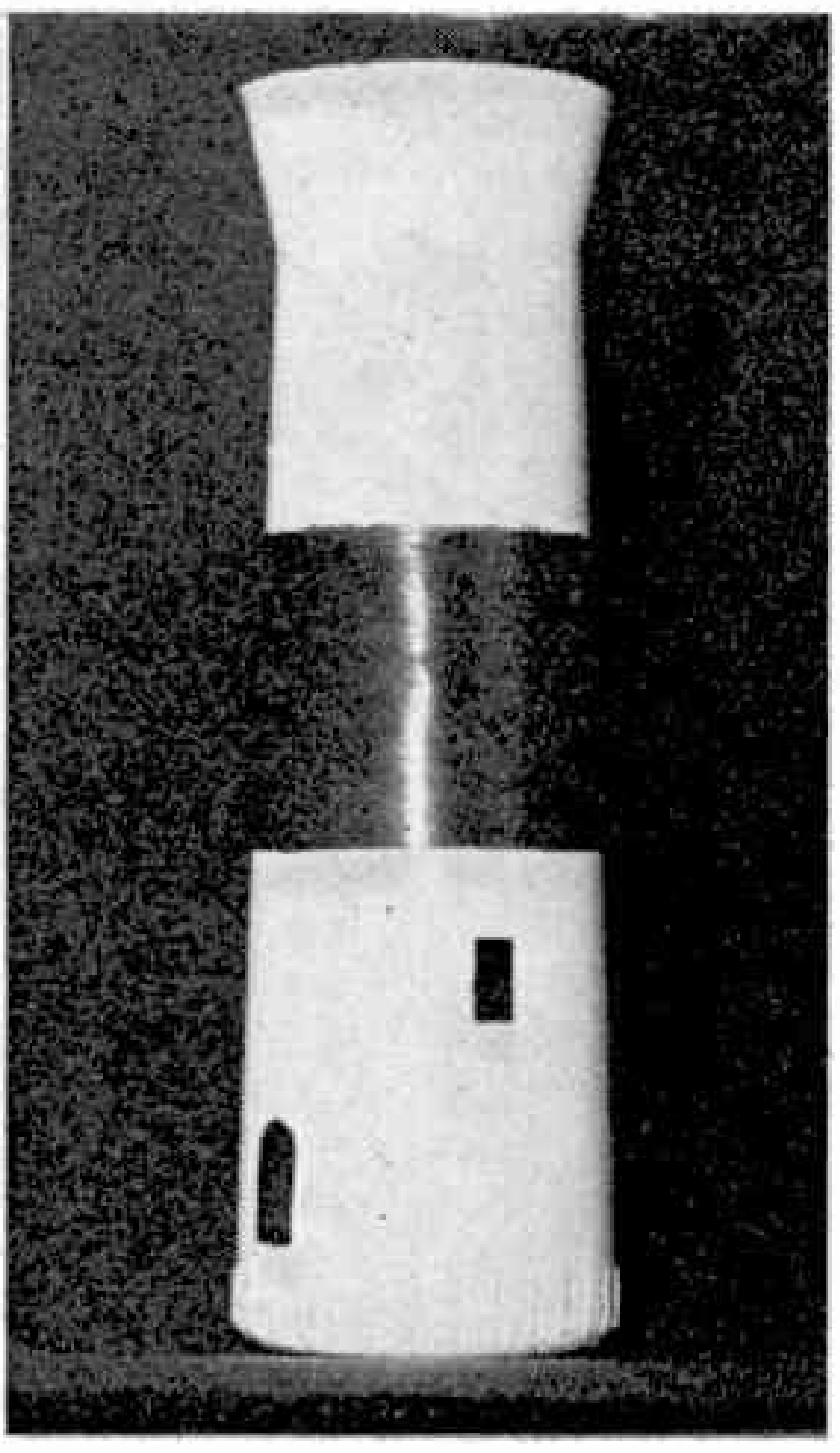
Left: An R.A.F. Buccaneer Mk.2 makes a low pass over the Hawker Siddeley airfield at Holmeon-Spalding Moor, Yorkshire.

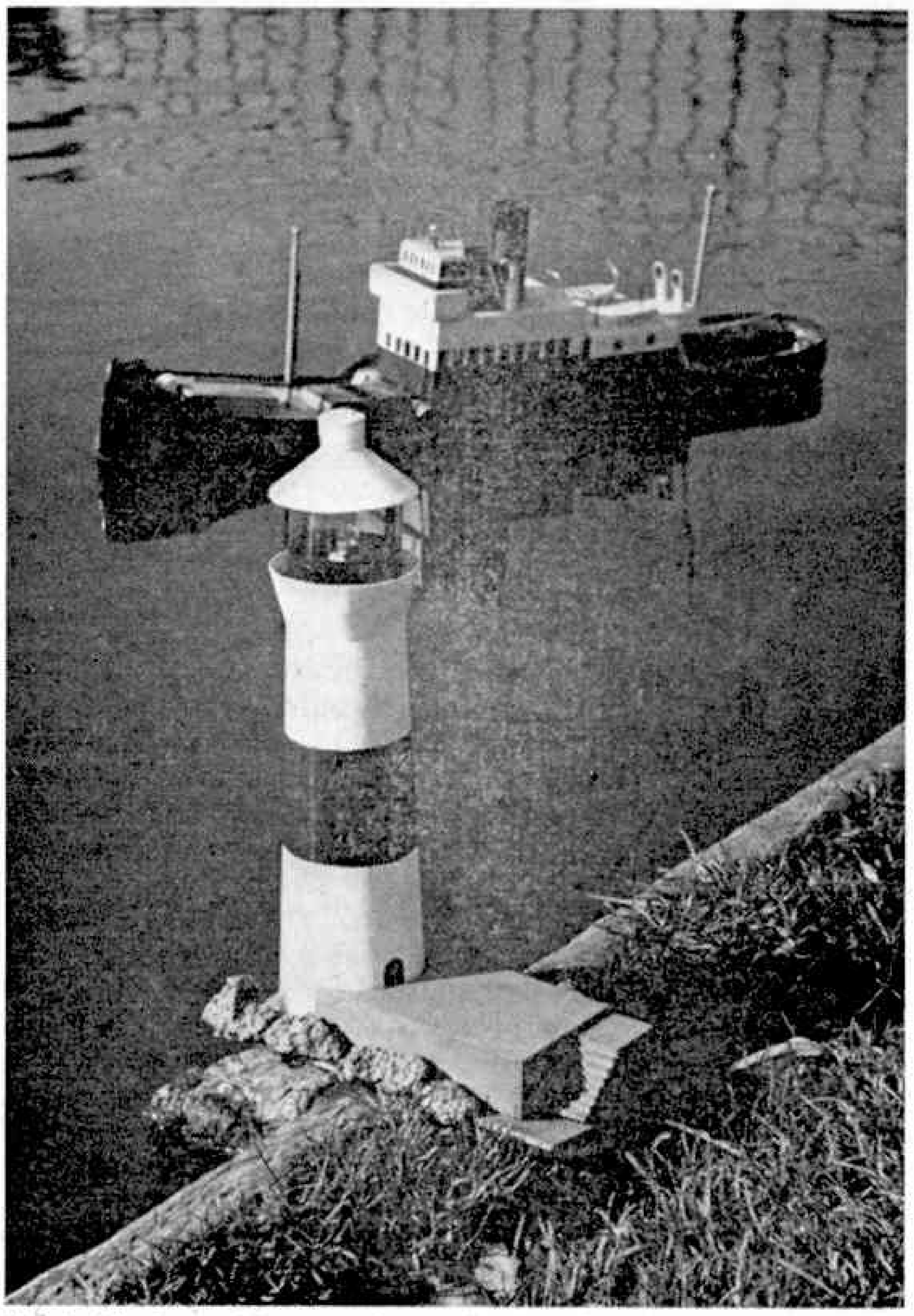
A MODEL LIGHTHOUSE

A simple but effective model conversion from an idea by C. Redford

WE THOUGHT that readers would be interested in this simple model, especially all the boating enthusiasts and Radio 4-2 followers who have built or are building "Corker," and would find a use for it, either as a market buoy or just an interesting ornament. The idea for this amusing model must be credited to Mr. C. Redford of Basingstoke, Hants, who noticed the likeness between a "Fairy Snow" plastic bottle and a lighthouse whilst washing-up (he points out that the washing-up bit is not a rare occurrence).

Unfortunately the shape of the "Fairy Snow" bottle has recently been changed, and so we had to search around until we found a bottle of similar dimensions. The one we finally decided to use was the "Timothy Whites" washing-up liquid bottle which, as can be seen from the accompanying photograph, is very much like a lighthouse. The following text and illustrations give the necessary step-by-step instructions needed to build the model.





The finished model, complete with landing stage, is placed in its most natural position—by the water. It can be seen from this photograph, how realistic the model looks.

The first step towards construction is to cut the top off the bottle at the point shown in the diagram, thus forming the roof and the main body of the model. From the roof, remove the stopper tag and the nozzle, which will naturally leave a hole. This hole can be used to locate either an aerial or a weather vane, alternatively it can be sealed over with a heated knife blade or similar.

Construction of the gallery floor and lighting is the next step, and dealing firstly with the gallery floor, use either balsa or card. If card is used, it must be at least an ⅛ in. thick, preferably more. We used ¼ in. balsa and found it ideal, as it was easy to use, and also provided a solid base. Put a small chamfer on the edge of the balsa so that it fits neatly into the neck of the bottle approximately ½ in. below the surface. Do not fix this permanently for the moment. Lighting consists of a bulb holder obtainable from Woolworths for approximately 1/6d., and a small 3.5 volt flashing bulb. The holder is attached by two screws—another good reason for using balsa for the floor, in preference to card. Two other holes of approximately ⅛ in. diameter, must be drilled into the floor to take the power supply wires, but more of this later. The lantern house is a length of celluloid 2 in. wide and 8 in. long with a green band roughly an inch wide along its length. Join the two together, with a ½ in. overlap, using any contact adhesive.

At this point the basic construction of the model is complete, and all that remains to be dealt with is the wiring and construction of the landing stage.

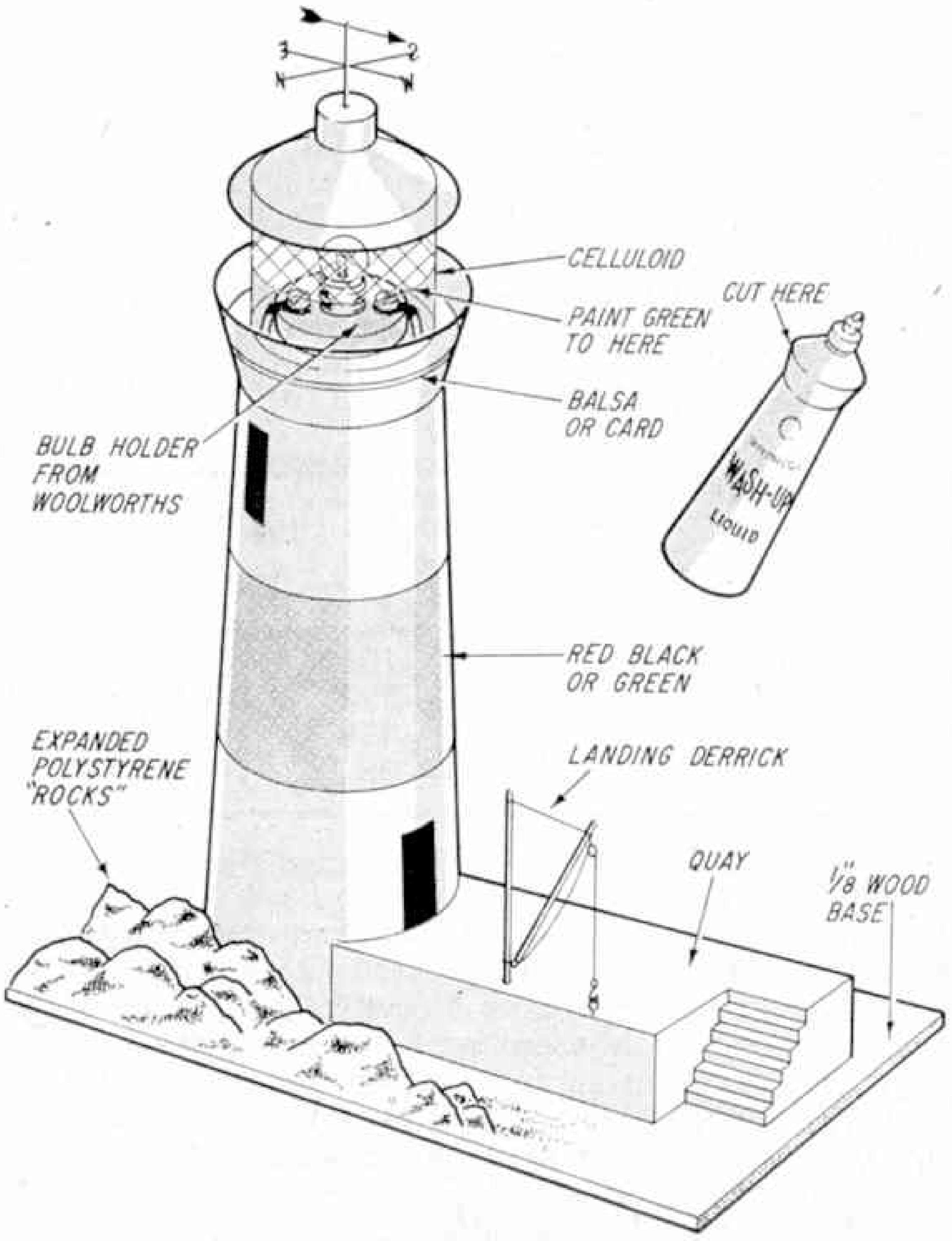
For the wiring, buy a one-foot length of household lighting flex and attach each wire to a terminal on a 4½ volt flat battery. Cut a small hole in the lighthouse, just below the door, for the wires to go through. Push the wires up the lighthouse, through the two holes in the gallery floor, and attach one wire to each terminal on the bulb holder.

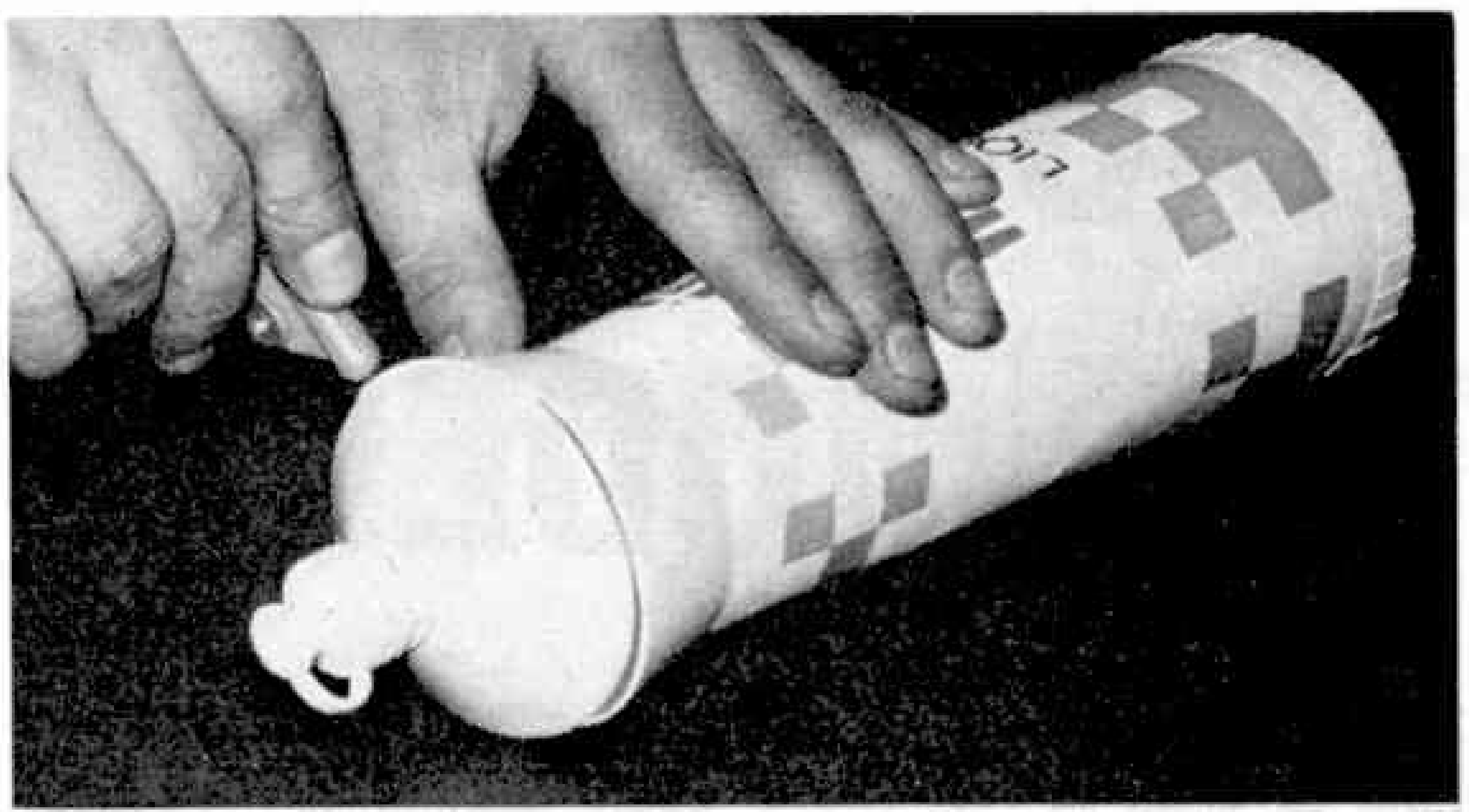
The landing stage is a rectangular box measuring 4¾ in. × 3 in. × 1 in., with the shape of the lighthouse cut out at one end (see photograph). The steps are made up out of 8 lengths of balsa all an inch wide cemented on top of each other, the top piece being an ⅛ in. shorter than the piece below it, and that an ⅛ in. shorter than the one below that, etc. A landing derrick, as in the diagram, can also be added if the builder wishes. The landing stage thus complete very conveniently conceals the excess wire and the battery.

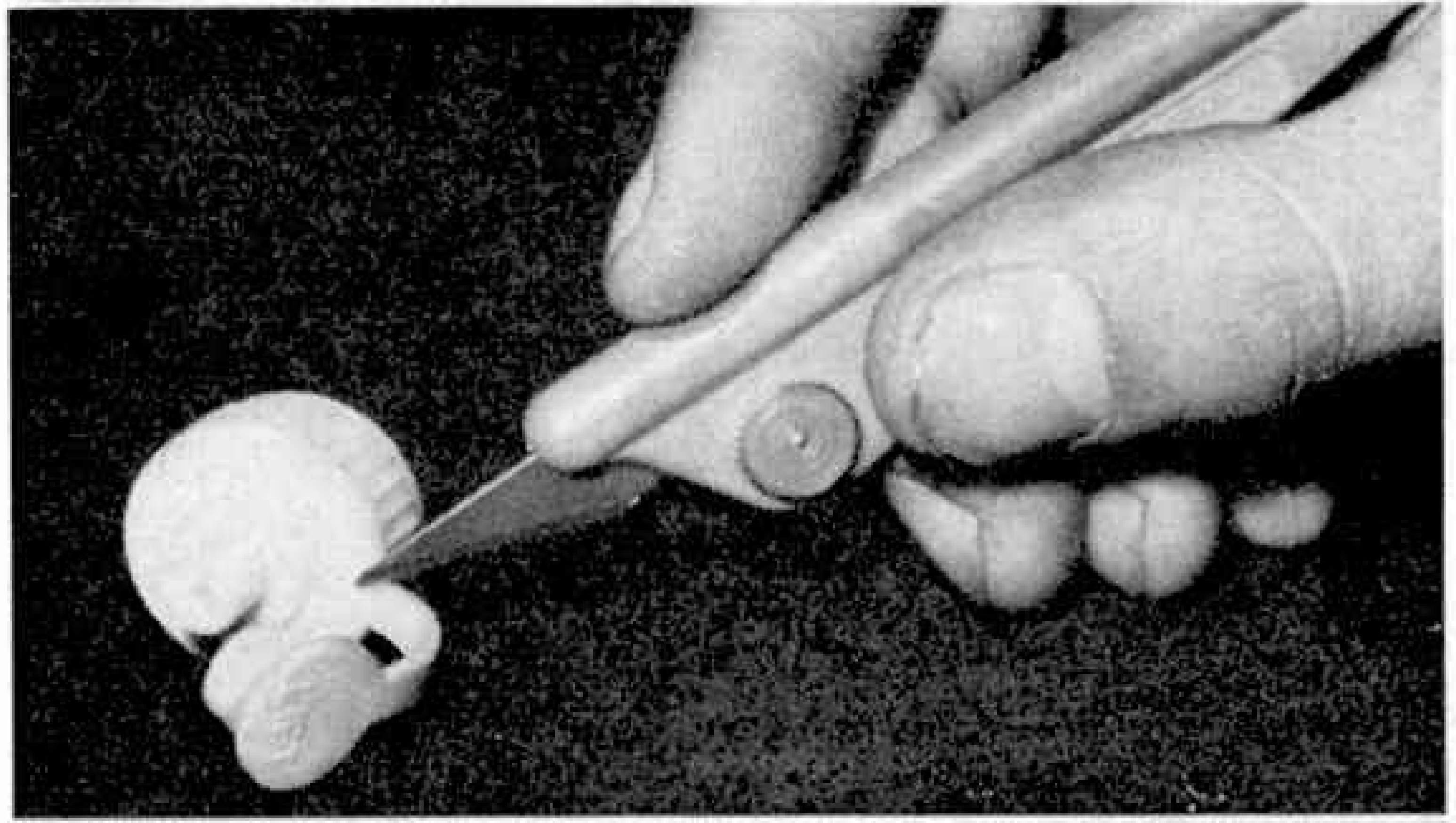
The model and the landing stage can then be mounted on an ⅛ in. wood base, either ply-wood or balsa wood is suitable. For added detail, expanded polystyrene can be broken up and made to look very much like rocks.

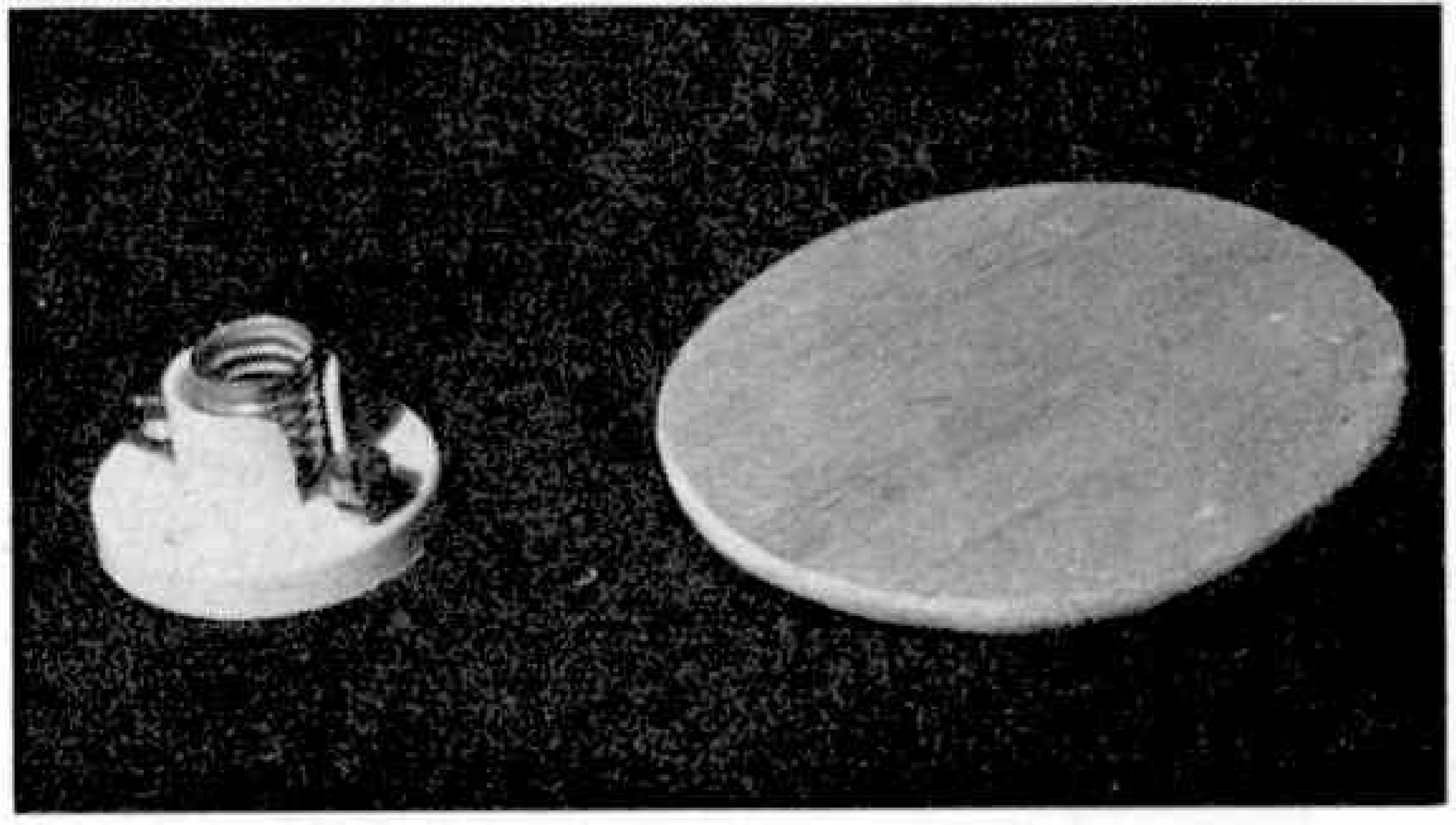
As far as painting is concerned we painted the lighthouse white with a red band around the middle. Remember when painting in the door and windows, that they are stepped up around the lighthouse (they follow the position of the spiral staircase), and do not go straight up the front. Before painting the landing stage and the base, you must give them at least two coats of sanding sealer, otherwise the paint will just soak into the wood. Ideal colours for these are dark grey, dark green or black, all matt. The rocks can also be a mixture of these colours.

Everything should now be fixed into position, except the landing stage, which should be removable for access to the battery, and the roof, for access to the bulb. To turn the lighthouse on and off, simply screw and unscrew the bulb.









Far left: A comparison between the original bottle and the half-finished model.

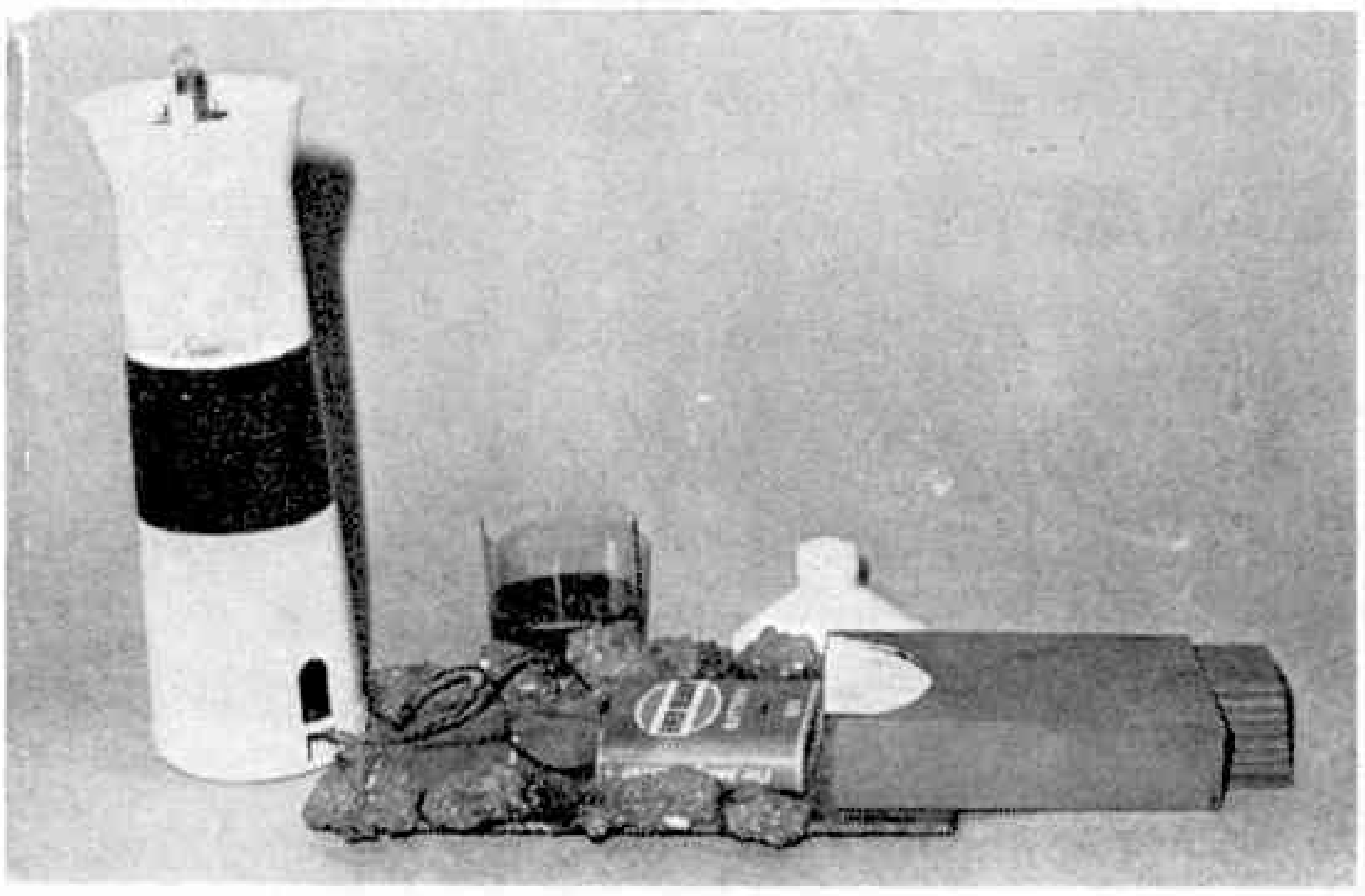
Above top: The first step is to cut the top off the container. A Humbrol craft-knife is ideal for this.

Centre: Remove the tag and the nozzle from the stopper.

Bottom: This shows the Woolworths bulb holder and the balsa wood gallery floor—⅛ in. balsa is ideal.

Left: This detailed diagram gives a clear indication of how the finished model should appear, and shows exactly where the top should be cut.

Below: A dismantled view of the model showing the battery and wiring. Note the polystyrene rocks.

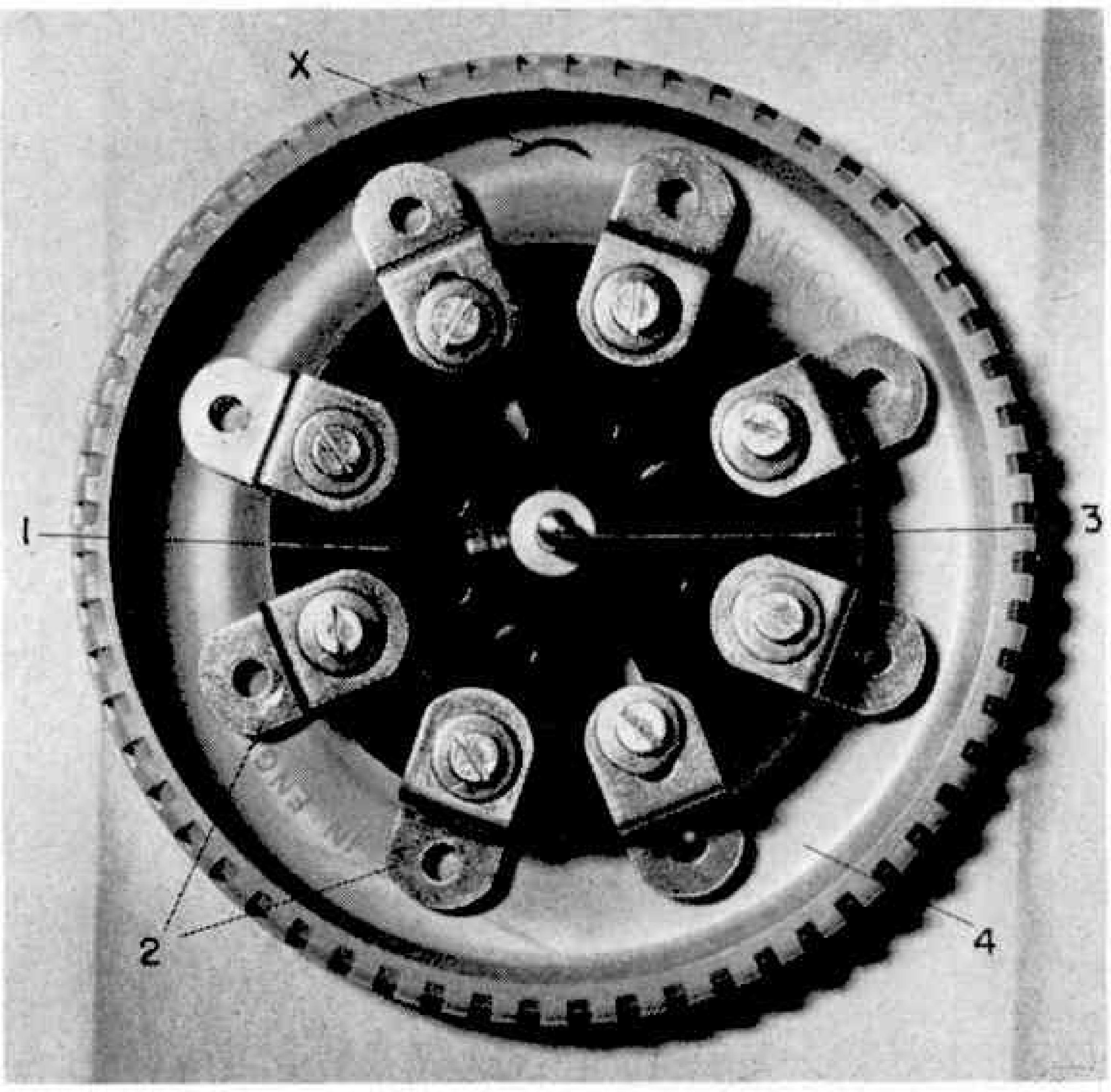


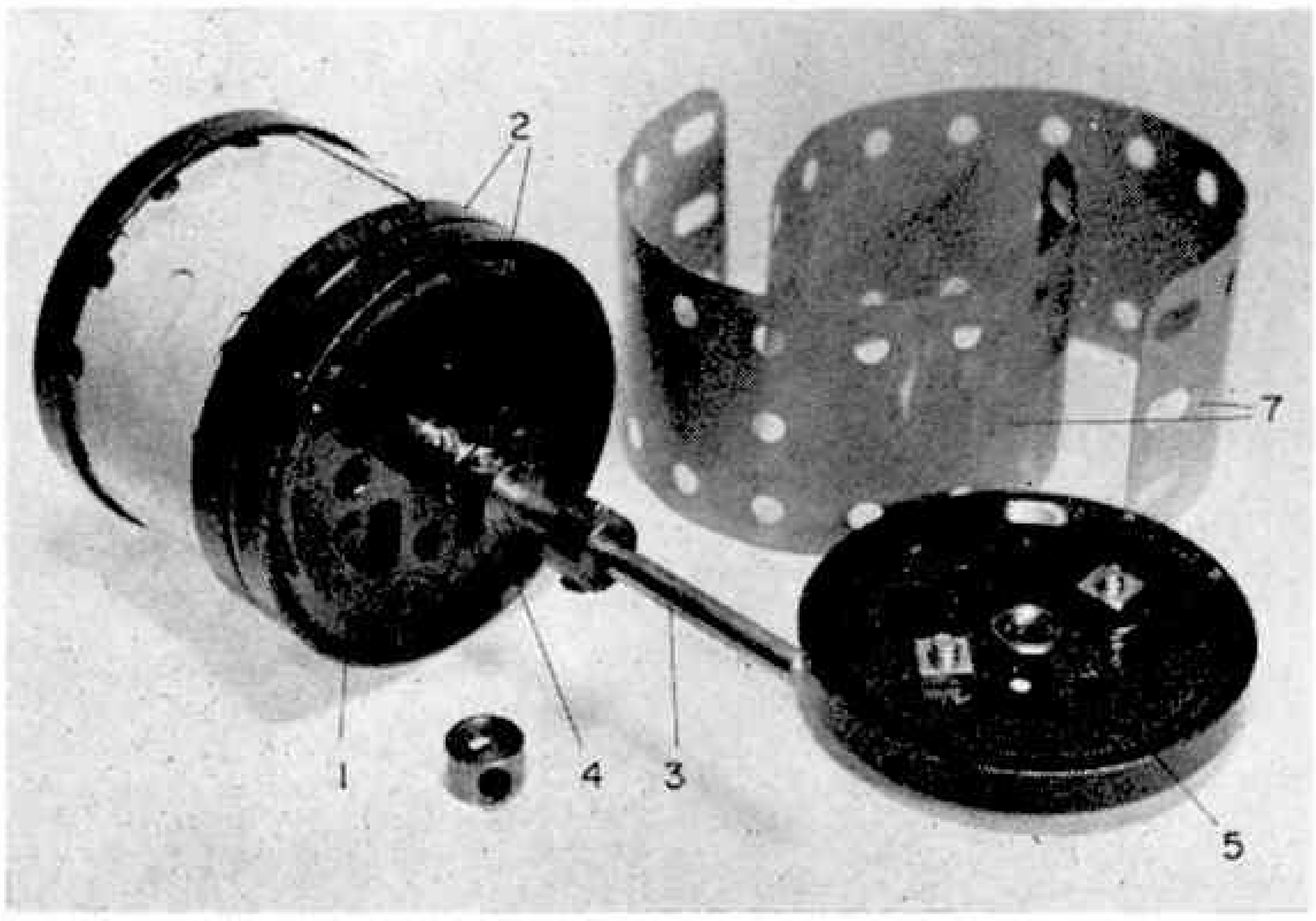
AMONG THE MODEL BUILDERS

with Spanner

AS ANY member of the Midlands Meccano Guild will tell you, you can always rely on Bert Love, Secretary of the M.M.G., to come up with something. From the Guild's point of view, this could be anything from information, through parts, assistance and advice to old and new literature, but, from my point of view, it is most likely to be useful material for *Meccano Magazine*. On a recent visit to Bert's home town of Birmingham, I spent a thoroughly enjoyable afternoon and evening with him and, sure enough, I didn't come away empty-handed. Shortly before I headed hotelwards, this man of infinite resource took up pen and paper and, after a few minutes of frantic scribing, presented me with complete details, including photographs (previously taken) of a couple of Meccano-built jigs designed to assist in assembling other constructions in which accuracy is essential."

"Professional engineers," writes Bert, "make frequent use of jigs in setting up precision engineering and this principle can be of great help to Meccano model-builders. Perhaps the simplest ready-made Meccano jig is the large 4½ in. diameter Plastic Road Wheel, Part No. 187b, which is a versatile basis for balancing rotors and similar mechanisms such as clock escapement wheels. One example of the latter is the Face Plate escapement wheel, frequently found in Meccano Clocks, the precise balance of which is essential for accurate time keeping. The first accompanying photograph shows a typical escape wheel made from a Face Plate 1 fitted with eight Reversed Angle Brackets 2 and mounted on a short Axle Rod 3. This Rod will spin freely when mounted in the boss of the Plastic Road Wheel 4, as shown. By making a datum mark X inside the rim of the wheel with a felt-tipped pen, each Bracket of the escape wheel can be adjusted to match up in complete concentricity.





"Because the large Plastic Road Wheel, rigidly set in a deep thickness of plastic material, has an outstandingly robust boss, its basic use as a circular jig can be extended by bolting it to a framework supplied by a 6 in. Circular Plate 1 and 9⅞ in. Flanged Ring 2, linked by four 4½ in. Perforated Strips 3 as shown in the second photograph reproduced here. Using this method, flywheels and other circular rotors of large diameter can be built with a constant check on concentricity. A slip of white paper 4 is locked between the 6 in. Circular Plate and Plastic Road Wheel, the paper then being marked with the required data. Couplings mounted on Axle Rods in a three-way Rod Connecter 5, as shown, illustrate the principle of adjustment against the required datum mark."

PARTS REQUIRED

Small Jig		Large Jig	
1—17	1—109	3—2a	3—63
8—37a	8—125	3—15b	1—146
8—37b	1—187b	12—37a	1—167b
8—38		12—37b	1—187b
		4—38	1—213b

Smooth-face roller

Moving on, now, from jigs we come to the entirely different subject of road rollers. These have always been popular with Meccano modellers, yet, at the same time, they have always presented builders with something of a problem because of their large front roller. In virually every case a Meccano-built roller has made use of Flexible Plates in its construction and this has invariably meant a number of boltheads projecting through the face of the roller to marr realistic operation. Recently, however, the problem was solved, at least for smaller models, by Mr. Pat Lewis of Formby who designed the compact but highly effective unit illustrated here. It in fact only uses four Bolts and none of these in the roller face.

In the unit illustrated, two 2 in. Pulleys 1 are located, one each, in two Wheel Flanges 2 mounted back to back in the centre of a 5 in. Rod 3. Note that the Pulleys are free on the Rods, but are held in place by Collars 4. Another two 2 in. Pulleys 5 are then bolted, one to the inside face of each of two further Wheel Flanges 6, the Pulley bos projecting through the centre hole in the Wheel Flange, and three Washers on the shank of each securing Bolt spacing the Pulley from the Wheel Flange. It will be seen that, in every case, a small space remains between the rim of the Pulley and the flange of the Wheel Flange. Slotted into this space as shown (after the Pulley 5/Wheel Flange 6 arrangements have of course been mounted on the Rod) are two pairs of two overlapping 5½ × 1½ in. Flexible Plates 7, curved to shape. Note that the latter Pulley/Wheel Flange arrangements are held on the Rod by Collars, as before, and are not themselves secured.

PARTS REQUIRED

1—15	4—37a	6—59	4—137
4—20a	12—38	4—111c	4—189

Simple hints

Complete mechanisms suitable for inclusion as units in a variety of models are of course invaluable to the Meccano builder, but simple hints and ideas on how to overcome particular difficulties can be just as important and useful, especially to new modellers. With this in mind, I think it is well worth passing on some comments sent in recently by Mr. L. R. Atkinson of Putney Heath, London S.W.15.

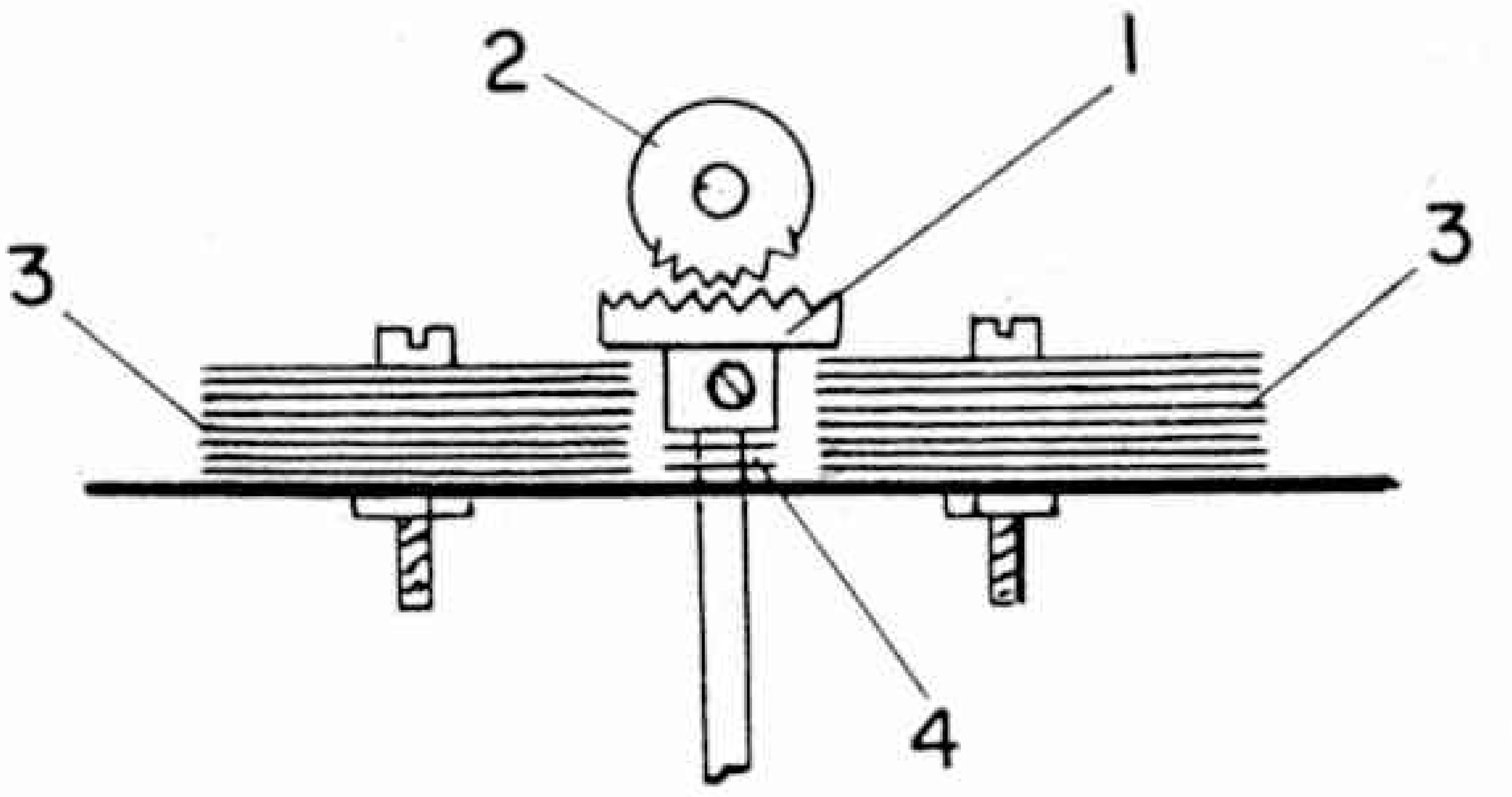
"Before I found the remedies," he writes, "I used to have trouble with the tension of Chain used in a horizontal plane. One link in or out often made the difference between an over-stiff drive and a Chain loose enough to work itself off the Sprocket Wheels. How to achieve the happy medium? I have found two ways:

a) Mount one of the vertical Rods in the round hole of a Flat Girder and bolt the Girder loosely to the model frame through the elongated holes. Fit the Chain to be comfortably loose while the Girder is slid near to the other Rod, then ease the Girder away until the correct tension is reached, whereupon the Girder is bolted tightly to the frame.

b) If the two vertical Rods must be at fixed distances apart, thus precluding the use of the above method, fit a length of Chain to be uncomfortably tight. Remove it and prise open the lugs of half-a-dozen links as if they were to be removed. Replace the Chain which will now be loose, then, with a suitable tool, close up enough lugs to shorten the Chain to the right tension."

Both these methods of overcoming Chain-tension problems are more or less standard practice with experienced modellers, but we tend to forget that not everybody knows all the "tricks of the trade." I therefore felt that the ideas should not be discarded as many readers will not have come across them before.

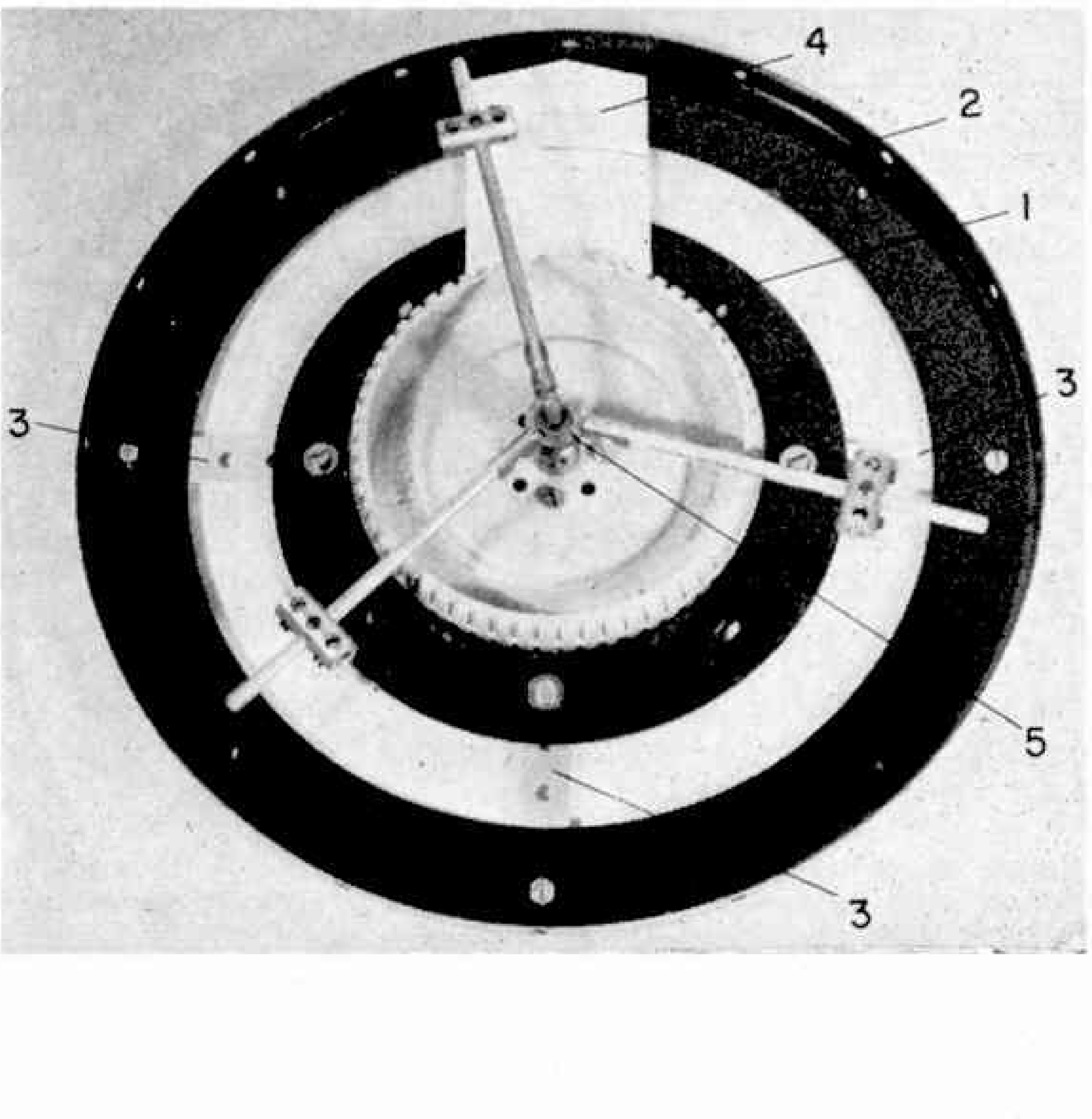
Heading: Meccano road wheel, Part No. 187b makes a perfect jig for the accurate assembly of many critical constructions. Left: A partly dismantled view of the roller assembly. Above: A diagramatical interpretation of Mr. Atkinson's idea. Right: For large assemblies the road wheel jig can be easily extended.



I, myself, have not come across another of Mr Atkinson's suggestions, this one for a way of raising a Contrate Wheel to enable it to mesh with a Pinion situated above it.

The usual way of doing this is simply to mount Washers on the Contrate Rod, but, as Mr. A. points out, there are occasions when one Washer can make all the difference between a too-loose engagement and a too-tight engagement. At such times Mr. A. suggests that the last Washer, causing the tight fit, be omitted to leave the system loose and, instead, two sets of short Strips (one on top of the other to give a thickness fractionally greater than the combined thicknesses of the Contrate boss and packing Washers) be bolted to the model on either side of the Contrate boss, so supporting the underside of the Contrate itself.

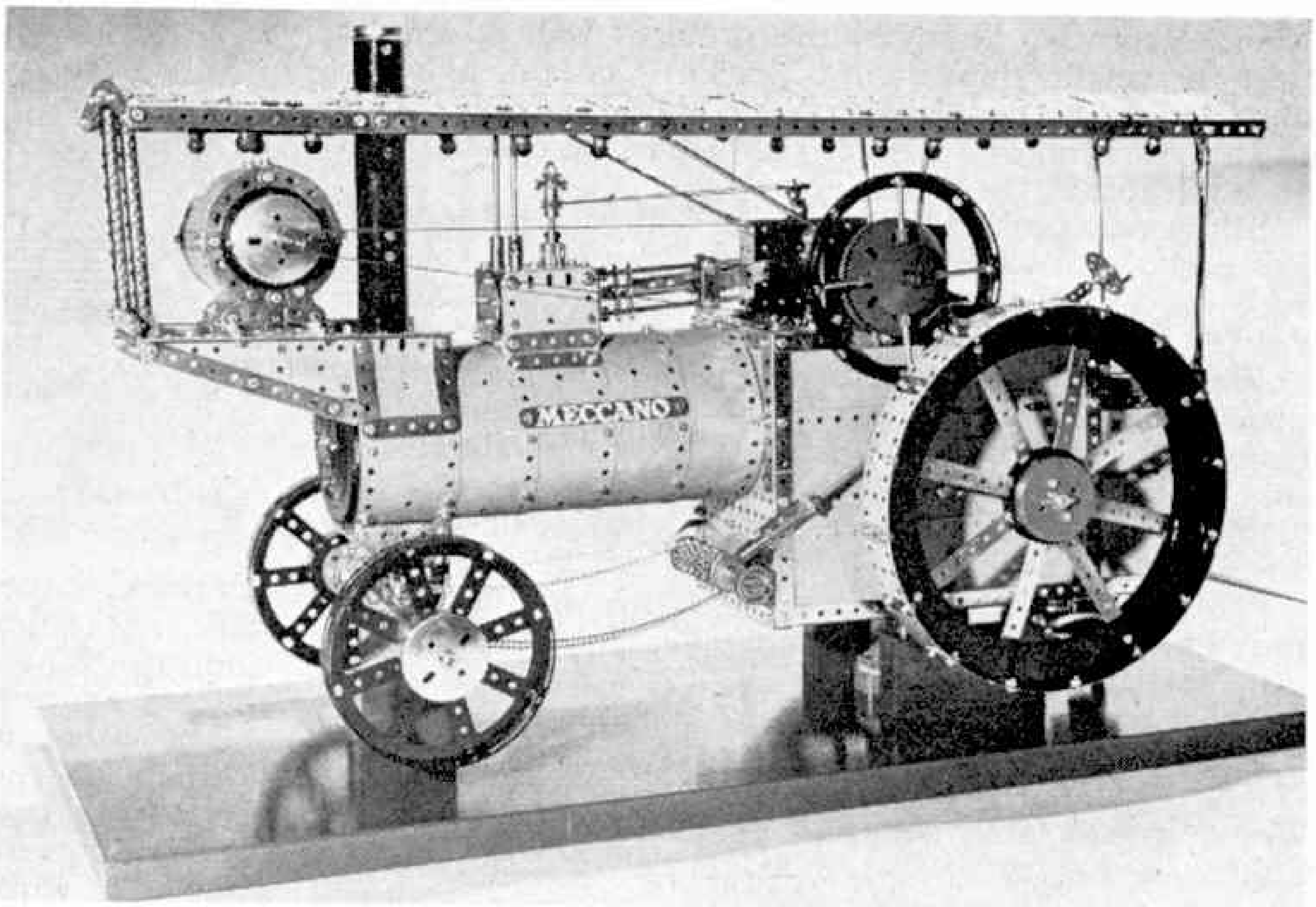
Our final offering this month comes in the form of a small car steering wheel, the inspiration for which came from Mr. Atkinson's 8-year-old son William. Construction is easy. The studs are removed from a Universal Coupling "spider" mounted on the model's steering column and into each tapped bore is inserted a short length—about 2 mm.—of single-strand lamp flex followed by an ordinary $\frac{7}{32}$ in. Meccano Bolt, the slot of which should end up at right angles to the steering column. The flex acts as spacers for the Bolts, while the latters' slotted heads serve as mounting points for a 1 in. Rubber Ring representing the steering wheel rim. Completed, the wheel is highly effective, but Mr. Atkinson, himself, has the last word on the subject: "One-inch road Tyres used instead of the Rubber Ring will produce an effective wire wheel for small sports or racing cars." My thanks go to both Mr. Atkinson and William for their ideas.



THE SHOWMAN'S ENGINE

Described by 'SPANNER'

Conclusion

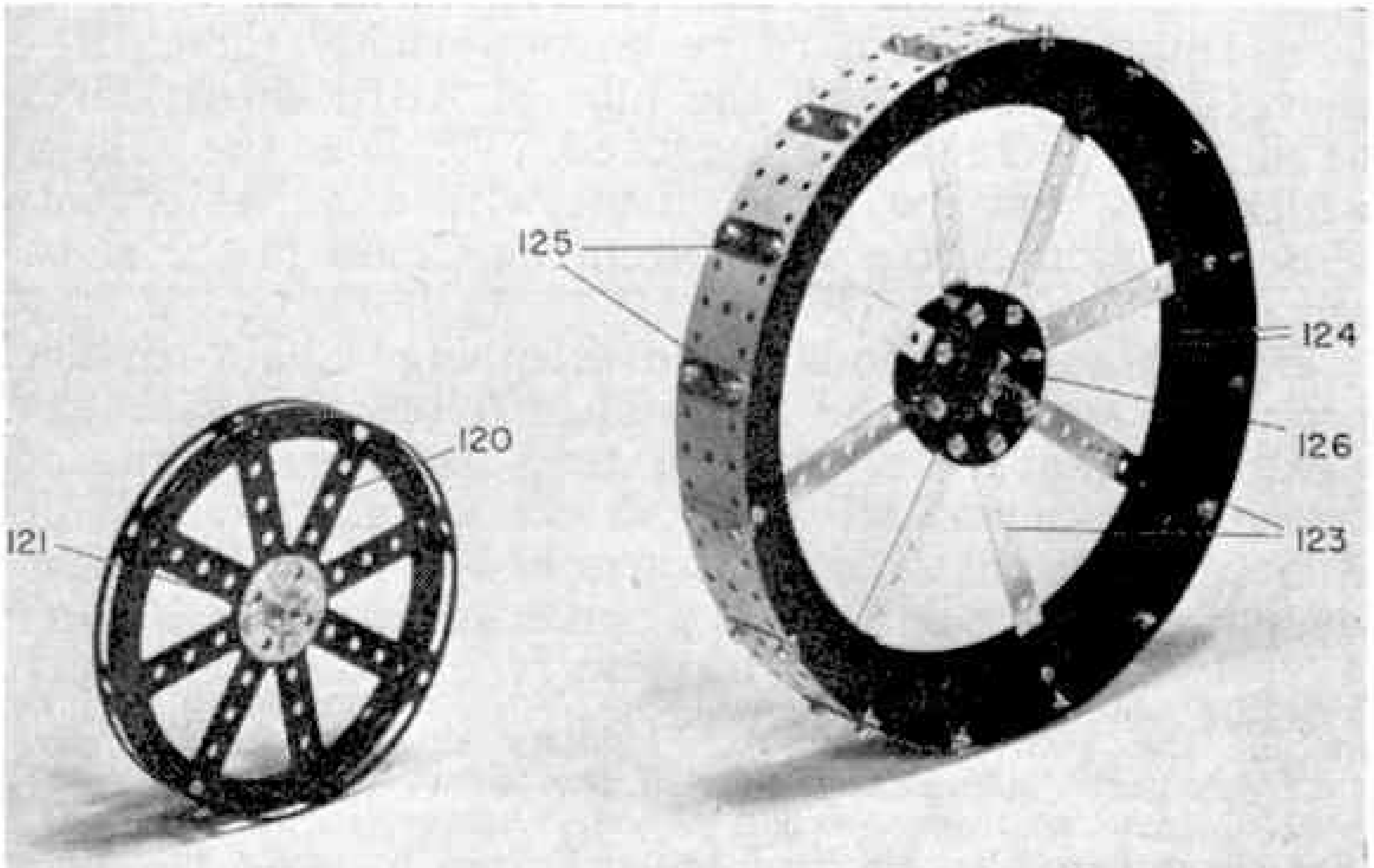


Front Axle and Wheels

This brings us to the rather substantial front axle incorporated in the Traction Engine. A 7½ in. channel girder 113 is constructed from two 7½ in. Angle Girders, bolted together at the ends, the securing Bolts also fixing the road spring to the top of the girder. This spring consists of one 7½ in., one 5½ in. and one 3½ in. Strip and a Double Arm Crank 114, all bolted together. Two Angle Brackets 115 are then fixed to the forward flange of the channel girder, while a Double Bracket 116 is bolted to the inside of the rear flange, in the centre. Journalled in this and in two 1 × ½ in. Angle Brackets 117, bolted to the end of the same flange, is an 11½ in. Rod held in place by a Collar and a 1 in. Pulley 118. Two 3½ in. Strips 119 are bolted to the forward flange of the girder, as shown.

Mounted on the ends of the 11½ in. Rod are the front road wheels, each of these being built up from two Hub Discs 120, to which a 5½ in. Circular Girder is bolted, as well as two 8-hole Bush Wheels 121, one each side. The Rod, of course, is fixed in the boss of the Bush Wheel. With the wheels in place, hubs are supplied by Boiler Ends 122, these being mounted on the 11½ in. Rod where they are held by Collars.

The rear road wheels are a little more complicated in design than those at the front. Four 4½ in. Strips 123 are first bolted to each of two 9⅞ in. Flanged Rings 124 which are connected together by sixteen 2½ × 1½ in. Flexible Plates, the joins between the Plates being overlaid by 1½ in. Strips 125. Two Face Plates 126 are then fixed to the free ends of Strips 123, the four Strips attached to the left-hand Flanged Ring being secured to the right-hand Face Plate, and vice versa. In each case the fixture is made by a ½ in. Bolt which passes through *both* Face Plates, a Collar being mounted on the shank of each Bolt to separate the Face Plates. In the accompanying illustration of the wheel, by the way, a short Rod can be seen mounted in the boss of the Face Plates. This was placed there to ensure proper alignment during construction and must of course be removed before the wheels can be fixed on the main axle.

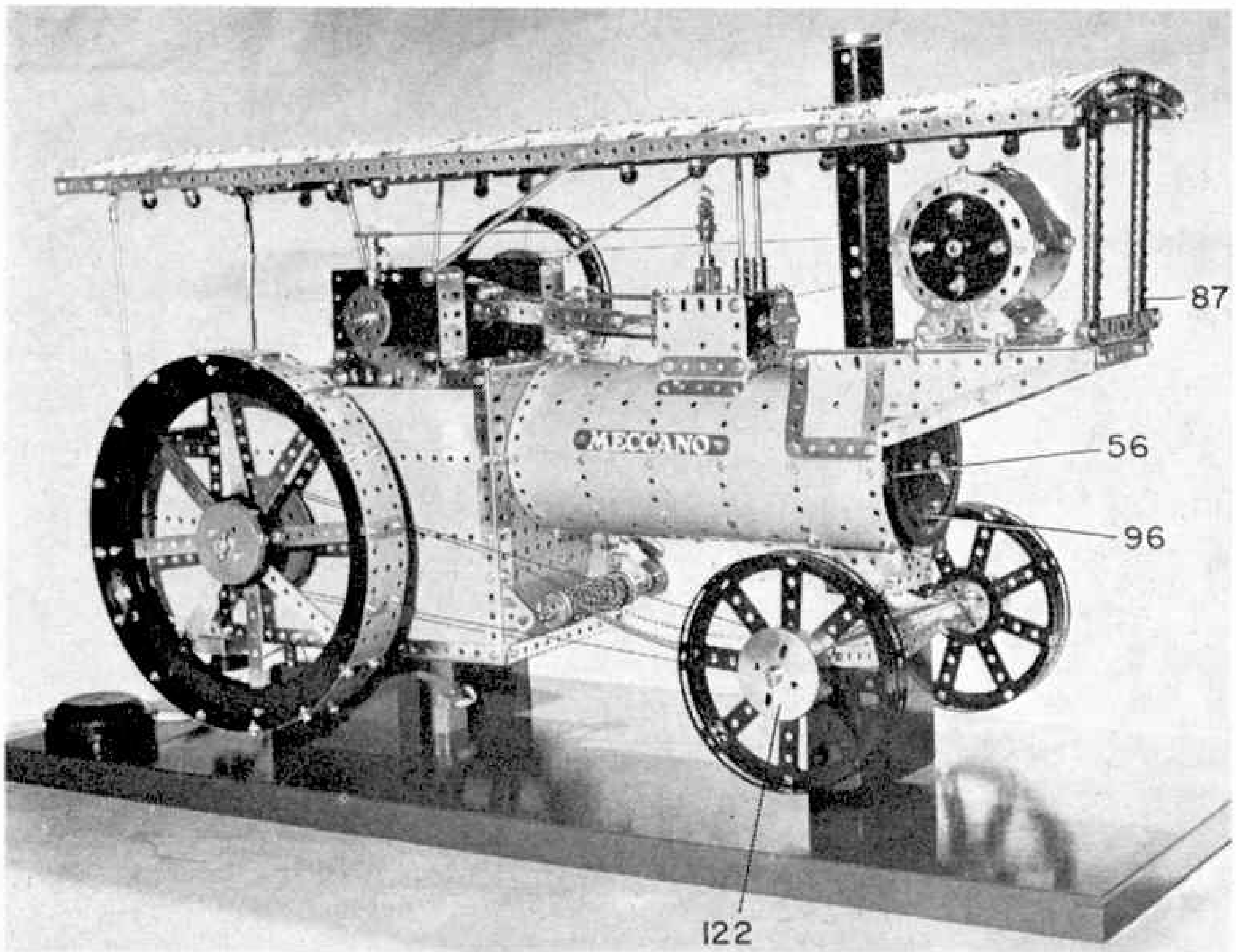


Single examples of both the front and rear wheels, both of which must be specially built up to give a realistic appearance to the model.

Assembly

All the individual sections of the model now having been built, they can be fixed together to form the complete Traction Engine. First of all the boiler assembly is secured to the body, this being achieved by means of Rod Sockets 21, 25 and the Socket fixed to the centre of Girder 22. The boiler is arranged so that its four internal formers line up with the Rod Sockets, after which Bolts are screwed through the boiler and into the transverse bores of the Rod Sockets. Strip 31 is then connected by a Strip Coupling 127 to Rod 96, while Strips 32 are lock-nutted to a Rod and Strip Connector fixed on a 2½ in. Rod sliding in rear Flanged Plate 57.

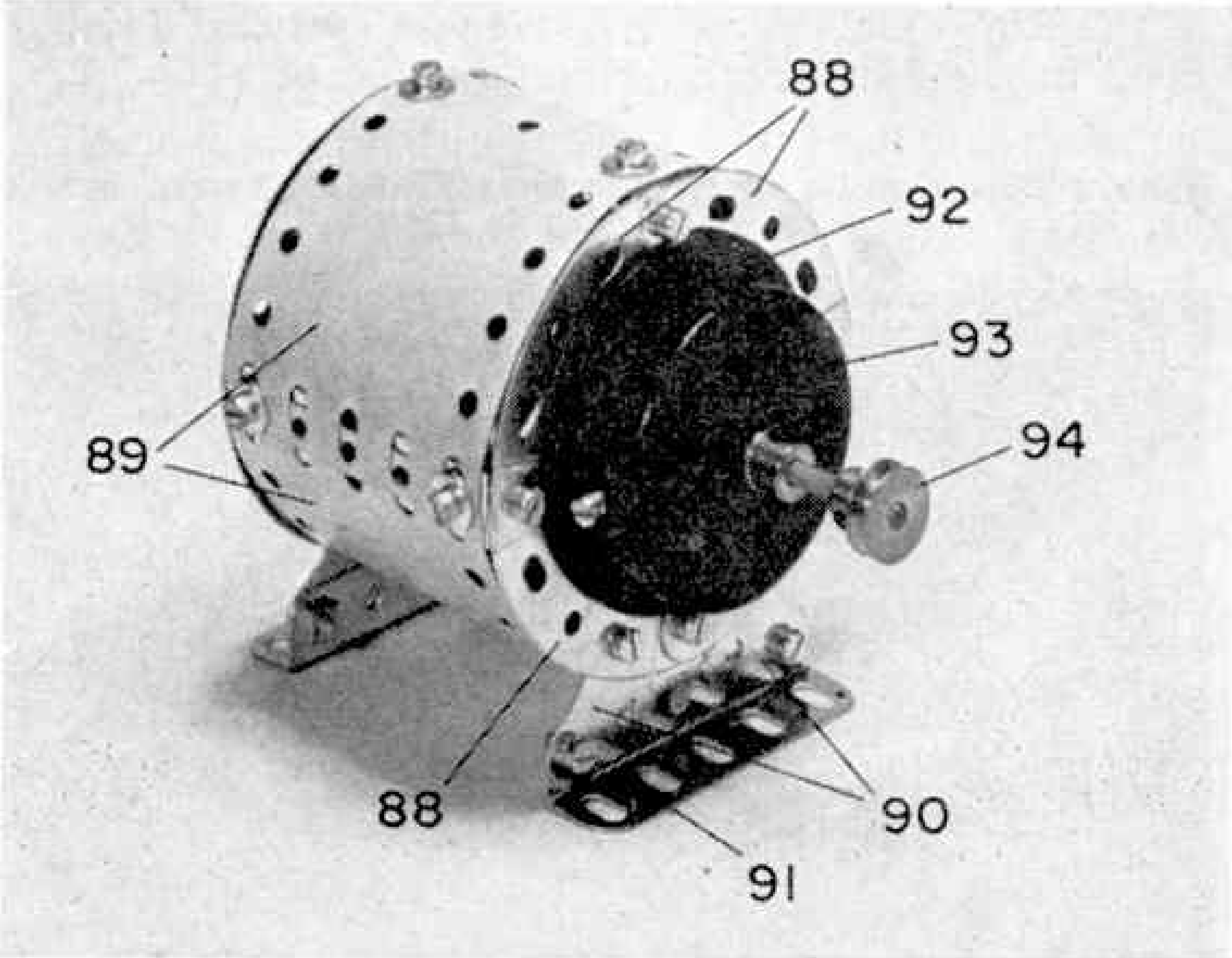
Next, the front axle is mounted in position on the 1½ in. Rod projecting from the perch bracket, the Rod being fixed in the boss of Double Arm Crank 114. A length of Sprocket Chain is secured to one end of channel girder 113, is brought back and wound several times round Sleeve Pieces 45 (or their substitute), then is taken forward again and secured to the other end of channel girder 113 to complete the steering linkage. Before the rear road wheels are fixed in place, however, the drive system should be completed. A 1½ in. Sprocket Wheel mounted on the crankshaft between left-hand Flanged Plates 13 and 14 is connected by Chain to Sprocket Wheel 50, Sprocket Wheel 52 also being connected by Chain to Sprocket Wheel 47 on the main



Left: This general view of the completed Showman's Traction Engine shows the model as it leaves the Meccano factory, mounted ready to go on display.

axle. Sprocket Wheel 51 is connected by Chain to the driving motor. In the original display models Meccano Limited use special long-running mains motors, bolted to Flat Plates 16, for driving purposes, but in a "private" model, a Meccano E15R Motor or Power Drive Unit would suffice. The best place to mount this unit would probably still be on Flat Plates 16.

Both rear wheels can now be added, followed by the canopy. The latter is supported by no less than eight stays, those at the rear consisting of two 6½ in. Rods, the upper ends of which are held in the Rod and Strip Connectors bolted to Corner Brackets 104 and the lower ends of which are fixed in Rod Sockets secured in the end holes of Angle Girder 17. Two more 6½ in. Rods are held in the bosses of Cranks bolted to the underside of the canopy, the Rods also being held in Handrail Supports fixed in the fourth holes from each end in the vertical flange of Angle Girder 24. The Cranks are secured to the canopy by Bolts passing through the holes marked X in the accompanying photographs and through the end holes in the arms of the Cranks which point straight forward from here.

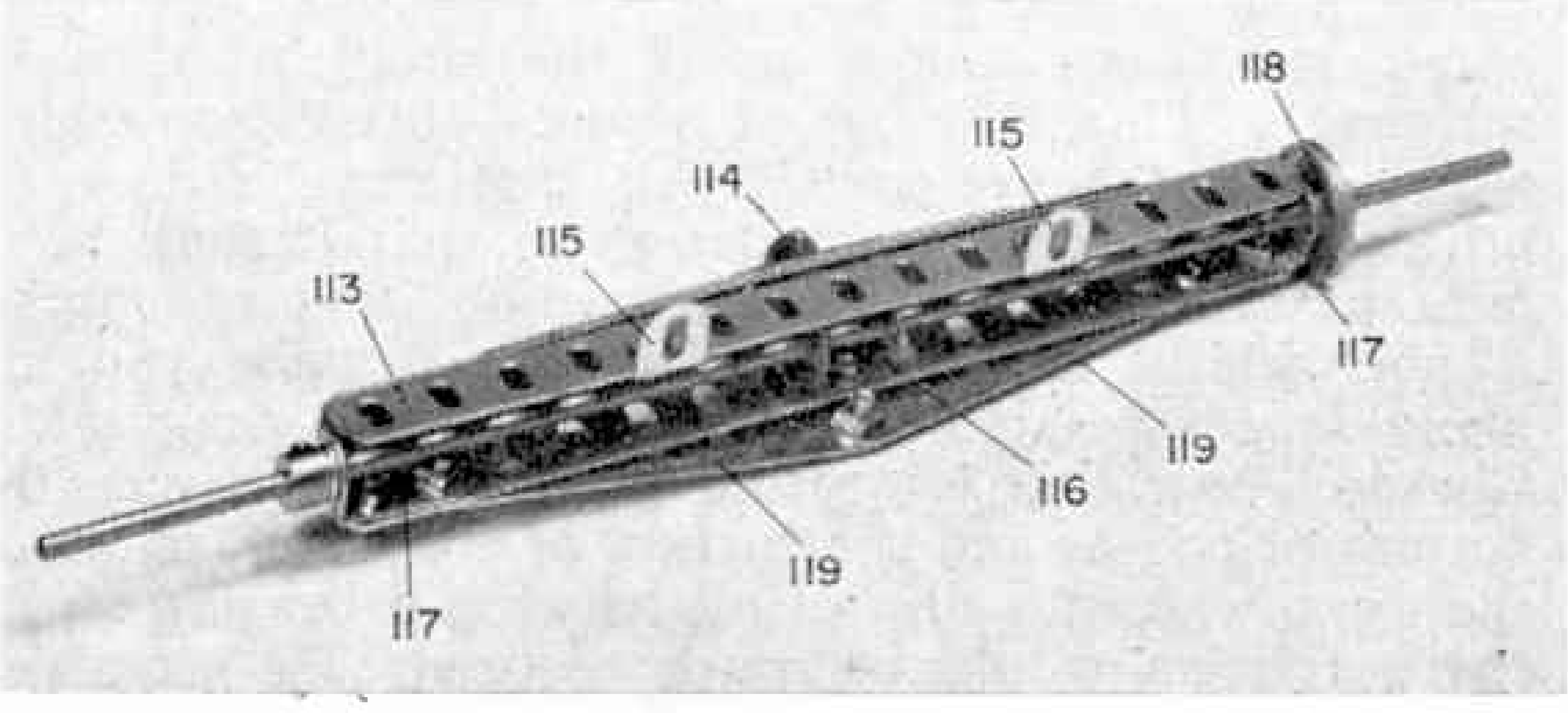


Below left: The complete generator as it appears when removed from its bracket on the boiler section of the model.

Further forward still along the canopy, two diagonally-mounted 5½ in. Rods are fixed in Rod and Strip Connectors 111, their lower ends being held in yet another two Rod and Strip Connectors bolted one to each Flanged Plate 13. The front stays, on the other hand, are supplied by two 5 in. Rods held in the longitudinal bores of Threaded Couplings 87. Mounted on each of these Rods are six Couplings, the top one being attached to the canopy by a Bolt screwed through front compound curved strip 102 and into the end transverse tapped bore of the Coupling.

All that now remains to be done is to fit coloured Elektrikit Lamps in the Lamp Holders and to connect the two leads from the earlier described Lamp Holder circuits to the two lower Wiper arms fixed to Insulating Spacers 46. The upper Wiper Arm is connected to one terminal of the power source for the Lamps, the other terminal of this power source being earthed by connecting it to a metal part of the model. This electrical system, if followed correctly, causes the Lamps to flash on and off, allowing only one set of Lamps to be illuminated at a time. When one set switches off the other set flashes on, giving a very striking effect, and one ideal for display.

It must be remembered, of course, that the model is designed specifically for display. It is despatched from the Meccano factory ready mounted on a wooden baseboard with the Traction Engine blocked-up to lift the wheels clear of the base. In fact, Angle Brackets 115 are incorporated in the front axle to serve as the anchoring points for the forward block and it is only because of the model's display role that Corner Angle Brackets 86 are included in the generator bracket—a "Meccano" nameplate is bolted to them. Whether displayed or not, however, it still makes a really impressive model that shows the Meccano system to its best advantage.



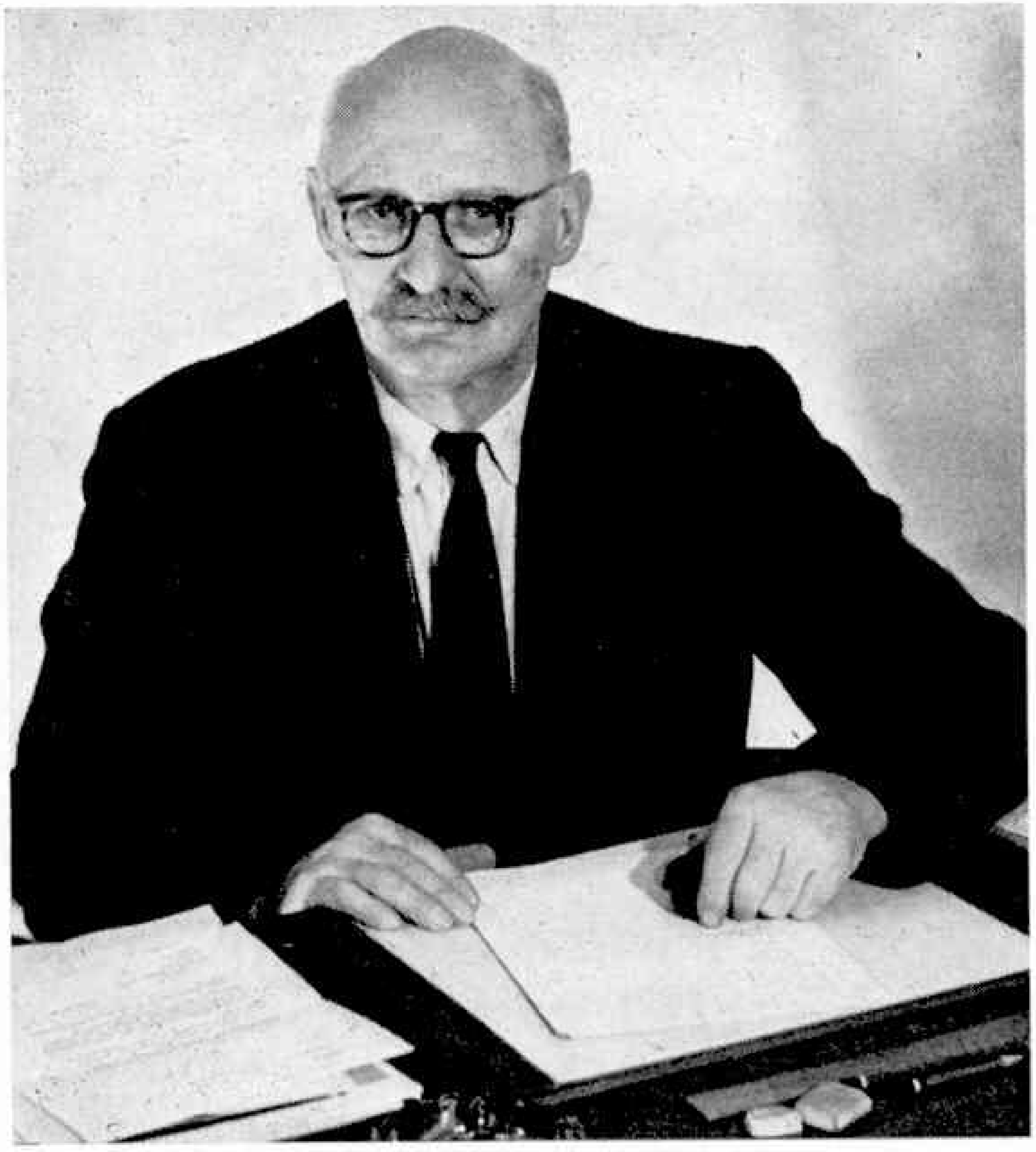
Below right: A sturdy front axle is one of the things to be expected on a Traction Engine. This Meccano unit fits the bill splendidly.

GREAT ENGINEERS—No. 23

SIR CHRISTOPHER COCKERELL

Born 1910

by A. W. Neal



IN THESE days of fast developing technology when committees or " working parties " set about solving given problems it is refreshing to find something brand new—something different to anything ever seen before. This is the case of the genesis of the hovercraft, Christopher Cockerell is the inventor of this unusual vessel and he even invented its name!

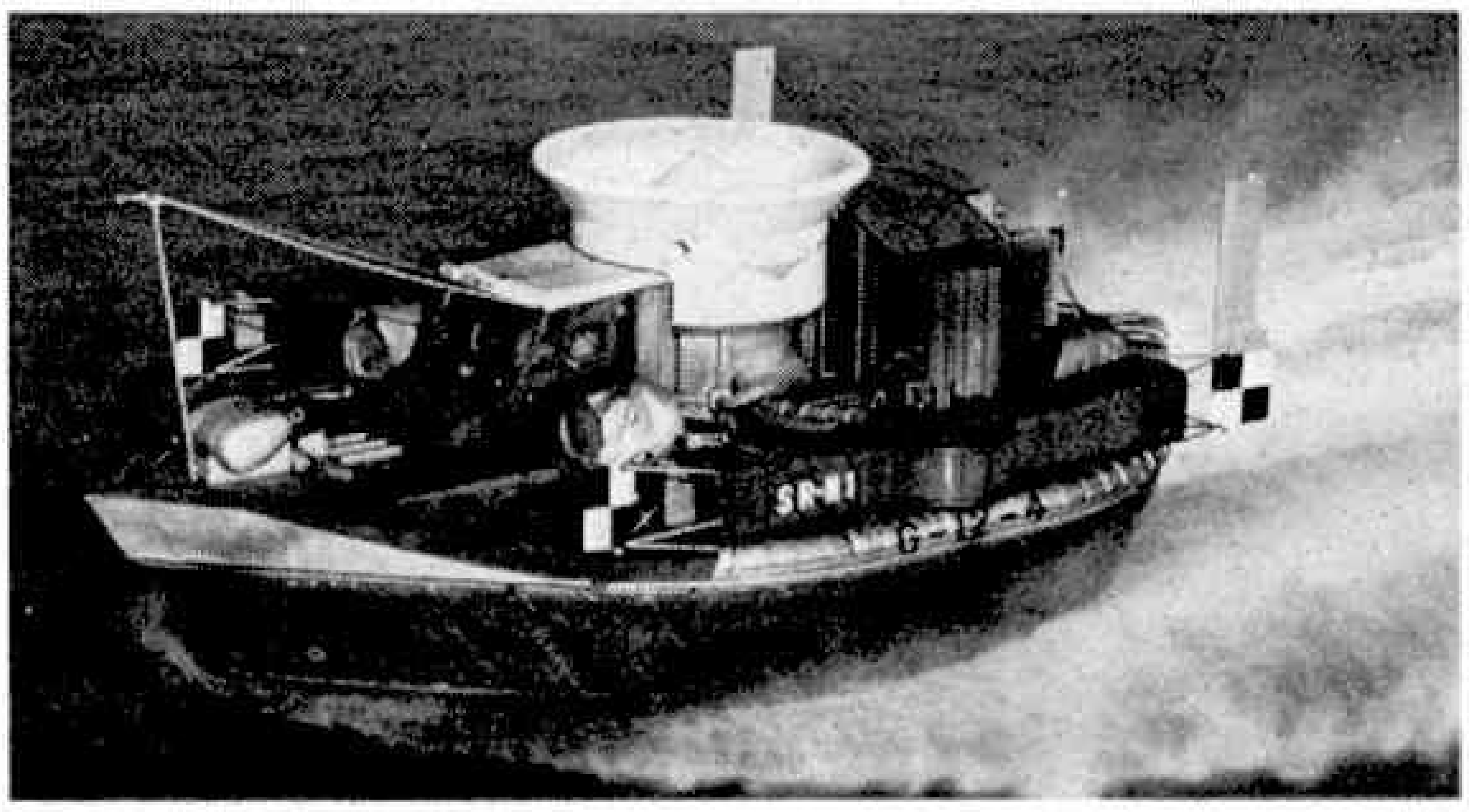
Cockerell was born on June 4th 1910, his father being the late Sir Sydney Cockerell who was curator of the Fitzwilliam Museum at Cambridge. Cockerell attended Gresham's School, Holt, and then went up to Cambridge where he read Engineering at Peterhouse. He seems to always have had an attraction towards mechanical engineering, and after obtaining his B.A. he went as a pupil to the well-known mechanical engineering firm of W. H. Allen of Bedford. He stayed with this Company for two years and then returned to Cambridge for a further two years for research associated with radio and subsequently obtained his M.A.

In 1935 he took a post with the Marconi Wireless Telegraphy Co. and worked upon various original projects connected with radio, some relating to direction-finding equipment for aircraft. He also lead a team for developing apparatus to plot the location of German radar posts during the late war.

Then came another turning point, the most important one in his career. In 1948 he purchased a caravan-building and boat enterprise, and he concentrated on the latter. His background was such that he could not be entirely satisfied with boat-building only. In a biographical sketch he said this: " Very soon in reading about boats one comes upon the problem of wave resistance. This, is a law of nature—this is, something which cannot be removed. All that can be done (if other things permit, is to design so that it shall be a minimum. Then comes skin friction, and of course, if you design for minimum wave resistance you are likely to get maximum skin friction, and vice versa." Cockerell saw that a stratum of lubricant between the bottom of a boat and the surface of the water, in much the same way as a film of oil between a bearing and a shaft, friction would be much reduced. He set about building a vessel on these lines, using air as the lubricant. Eventually, after many harassing experiments, Cockerell achieved his goal, his first working model being demonstrated in 1956. On 25th July, 1959 the world's first Hovercraft, the SRN1, crossed the English Channel. From then onward the story is largely one of straight-forward commercial development.

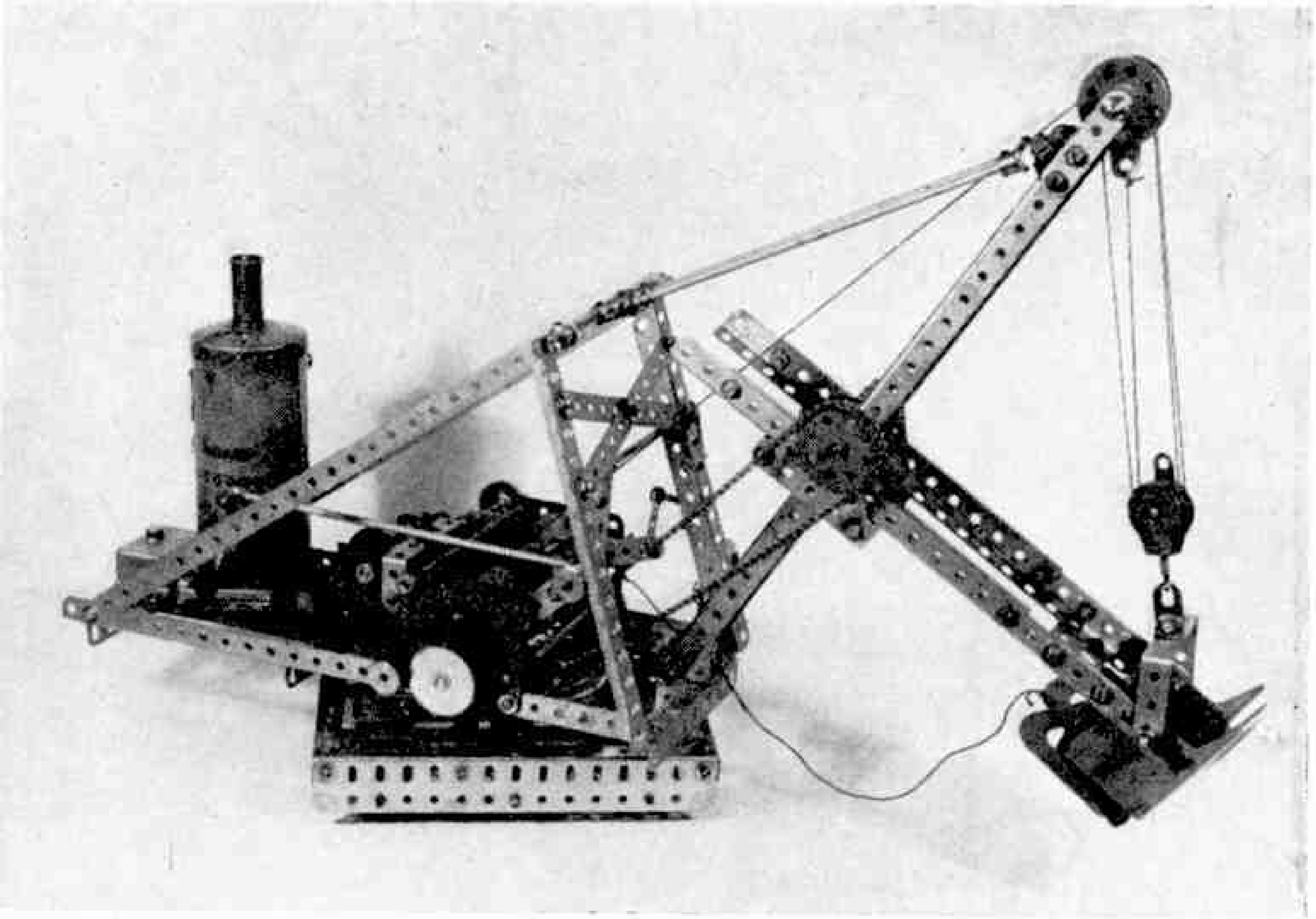
Rewards for his epoch-making invention have come to Sir Christopher Cockerell in the way of honours from many learned and other societies. He was made a C.B.E. in 1966. He was awarded the Churchill Medal of the Society of Engineers, the Albert Medal of the Royal Society of Arts. He is an Honorary Fellow of the Society of Engineers, an Honorary Fellow of the University of Manchester Institute of Science and Technology, an Honorary DSc. of the University of Leicester, and Honorary Member of the Southampton Chamber of Commerce and a Trustee of the National Portrait Gallery. He holds the Columbus Prize of the Istituto Internazionale delle Communicazione Genoa, the John Scott Award of the City of Philadelphia, U.S.A., the Elmer A. Sperry Award of New York, U.S.A., and he has been made an Honorary DRCA of the Royal College of Art. He was awarded a knighthood in the New Year's Honours List of 1969.

Below: The World's first Hovercraft SRN-1 pictured here on its initial trials in 1959.



THE MECCANO STEAM ERA

by Alf Hindmarsh



Above: A steam excavator built from a pre-war model leaflet using the original parts and steam engine of the era. Over page left: A picture of the original steam engine taken from a 1914 Meccano Publication. Right: The second Meccano Steam Engine. Note the detail on the boiler casing.

STEAM AS a form of power is fast slipping into the mists of antiquity. Already, steam traction is virtually dead on our roads and railways, while steam power in industry is something which has been rare for years. As the use of steam power has died, however, so the interest in steam relics of the past has mushroomed, until, today, most mechanically-minded people will adimt to a distinct feeling of nostalgia when a steam-driven machine is sighted.

We, in the Meccano world, are fortunate in that we can still work with live steam by building working models powered by the Meccano Steam Engine included in the current system.

Through the years, other engines have been available for enthusiasts, including two which were specifically made by or for Meccano Limited. Both of these Steam Engines had vertical boilers and the earlier type, an old illustration of which is reproduced in one of the accompanying photographs, was introduced as long ago as 1914. It is interesting to read the description given for this first engine as printed in the original Book of Prize Models of 1914-15; " A highly finished vertical steam boiler, embodying all the latest improvements. All working parts fully tested and guaranteed. Oxydised brass boiler, stationary cylinder and eccentric reversing gear, water gauge, spring safety valve, cast base, fittings nickelled and finely finished. Dimensions of boiler, 2½ in. diameter × 3½ in. long. Price 21/-."

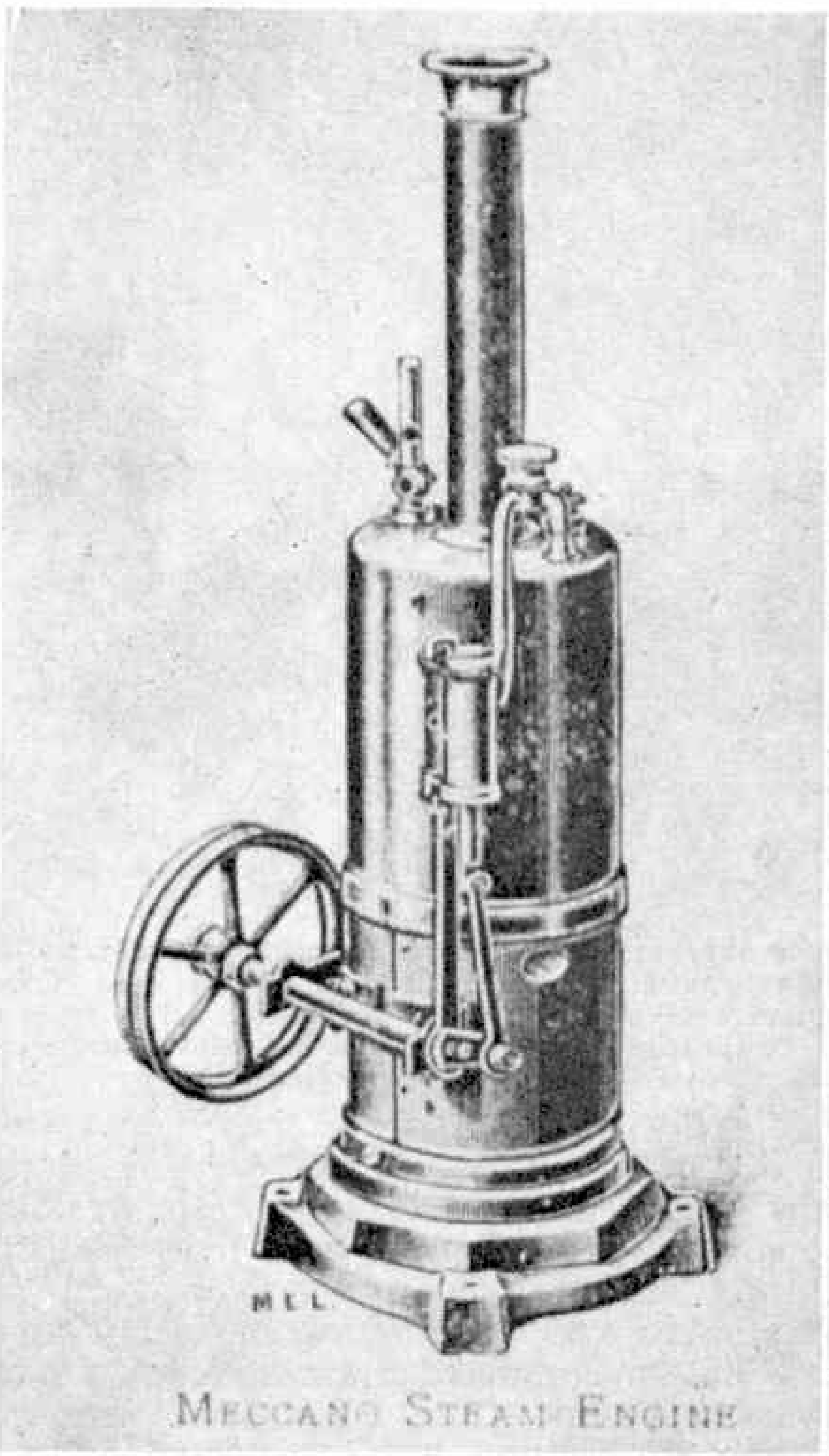
Later, in 1929, the second Meccano Steam Engine appeared, this being heralded on Page 720 of the September *Meccano Magazine* which did justice to its introduction with a full page spread. Any enthusiast who is fortunate enough to own one of these excellent Steam Engines will know that it is a first-class power unit of superb workmanship. The engine appeared in various colours and was sold in a presentation box complete with a special spanner, filler funnel and the Steam Engine Manual. It, also, was priced at 21/-. The boiler had an outside casing complete with such details as rivets, firebox and smoke box doors, inspection hatches, water level gauge, etc., which were raised in relief on the metal surface. The crank shaft, itself, was peculiar in being of smaller diameter than a standard Meccano Axle Rod, and having a special 12-teeth pinion fitted to it. The driven shaft was of standard diameter but had a special 76-teeth gear wheel mounted on it to engage with the special 12-teeth pinion—a rather unusual reduction gear ratio.

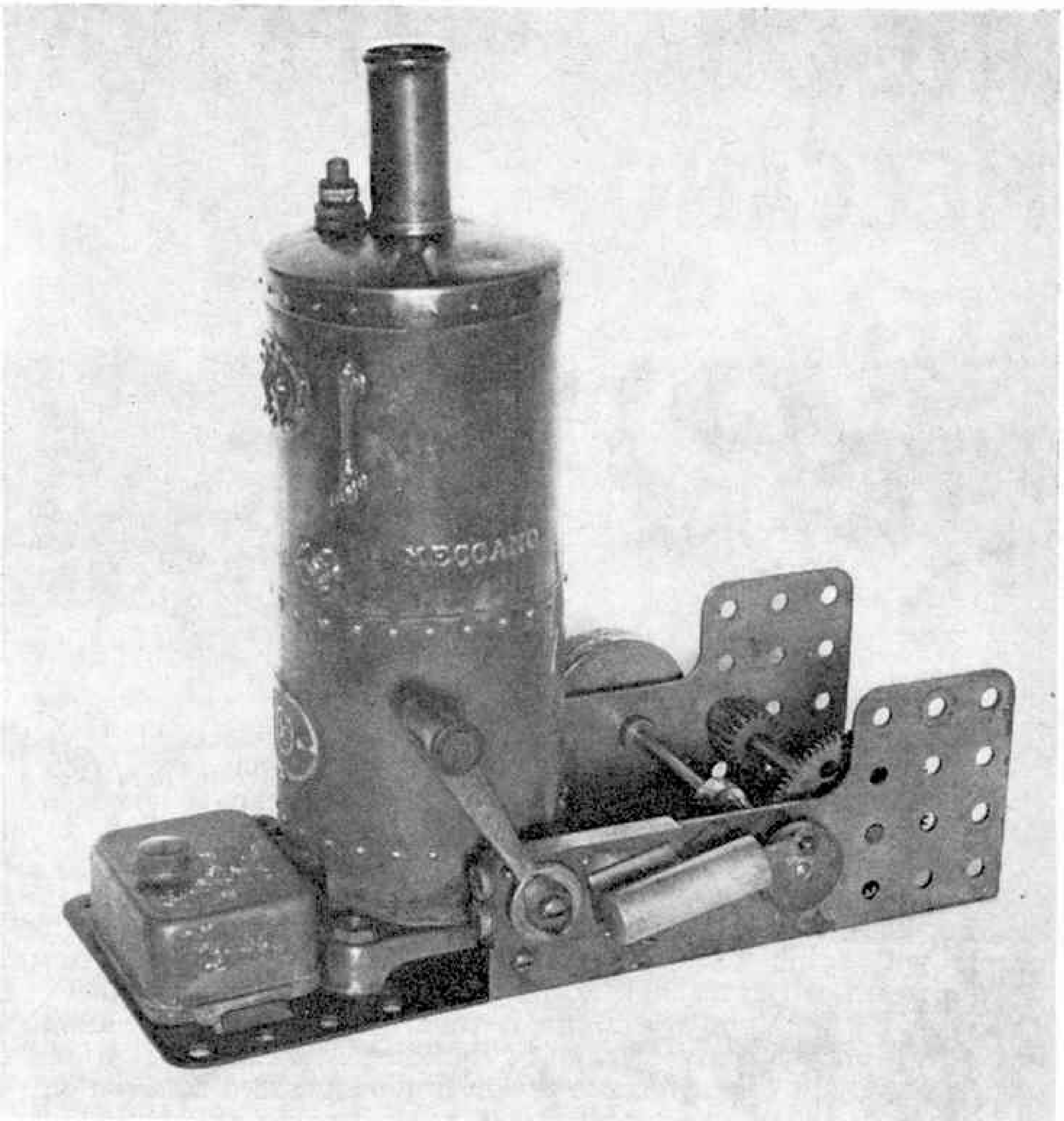
Like the current Steam Engine, the 1929 example was fitted with a reversing lever which would direct the steam to one of two ports on the reversing block, but, unlike the present unit, the exhaust steam was discharged through the boiler funnel in a most realistic manner. During its production span one or two variations were introduced, but they were in detail only, as in the case of the simulated drain-off cock. Such variations were apparent from illustrations of the period, but the basic design was in production until shortly before the second World War. As the base of the engine was drilled with holes at standard Meccano spacing, it would be bolted directly into the framework of Meccano models and its reversing lever was fitted with a threaded hole, (and in some cases a detachable plastic knob made of erinoid), so that link Rods or Strips could be attached for remote control. The reversing lever also acted as a speed control, or throttle.

In the interests of safety a well-designed spring-loaded safety valve was fitted to the filler cap and the spirit burner was inserted via a pair of clips which prevented the burner moving under vibration, and, while keeping the flame where it was required, under the seat of the boiler, the spirit tank itself was located outside. The steam pipe from the boiler also passed through the heating chamber and thus made good use of the boiler jacket in conserving heat to a maximum. Finally, the fly wheel, which was cast from a lead zinc alloy, was moulded in such a way as to balance the crank shaft to permit easy reversing.

Perhaps the most memorable model of this period of the Meccano Steam Engine is that of the Meccano Steam Excavator which appeared as an original Super Model Leaflet, No. 19A, at the time of the introduction of the Steam Engine. This is illustrated here, having recently been reconstructed by the author completely in original parts of the period. All the basic movements of the prototype are included, such as travelling, slewing, bucket racking and luffing, and the model, which works in a most realistic manner, performs all its functions at the touch of a control lever, operating through a comprehensive gear box.

Strangely enough, publicity for this wonderful and much-loved Steam Engine disappeared from the pages of *Meccano Magazine* in July 1935 to make way for the introduction of the 'Magic Motor' which has survived in its basic form and is still in production today.



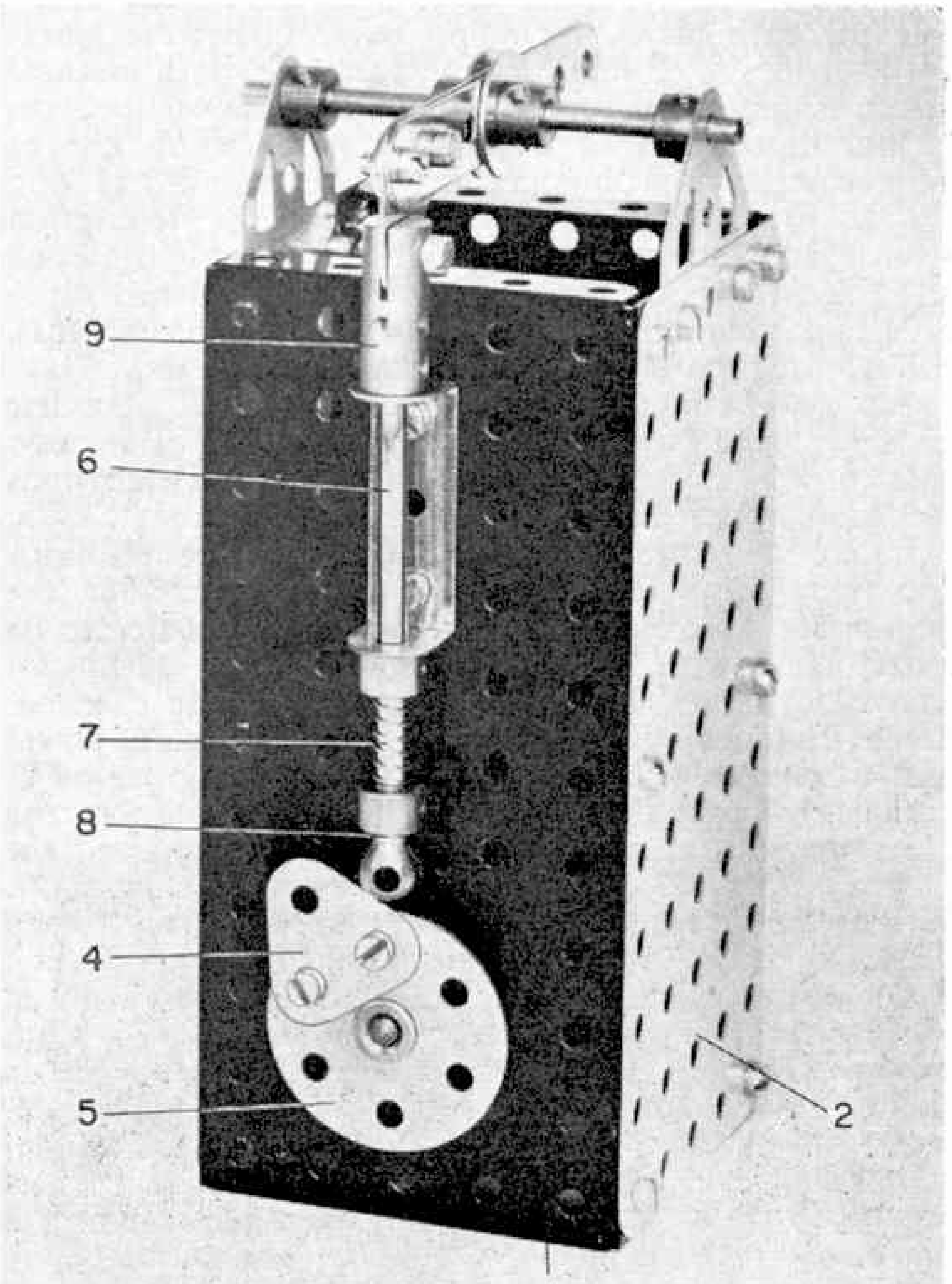


A BRAND NEW SERIES !

MECCANO CONSTRUCTORS GUIDE

STARTING NEXT MONTH

January's edition of Meccano Magazine will contain the first instalment of 12 monthly articles of great interest to all Meccano enthusiasts. The series will be illustrated with photographs and diagrams of Meccano mechanisms, structures, models and features of the latest trends in the Meccano system. The whole series will form a permanent addition to Meccano reference literature which will be invaluable to the constructor, young or old, regardless of the size of his Meccano outfit. A permanent order with your newsagent now will ensure that you do not miss any of this exciting new series.

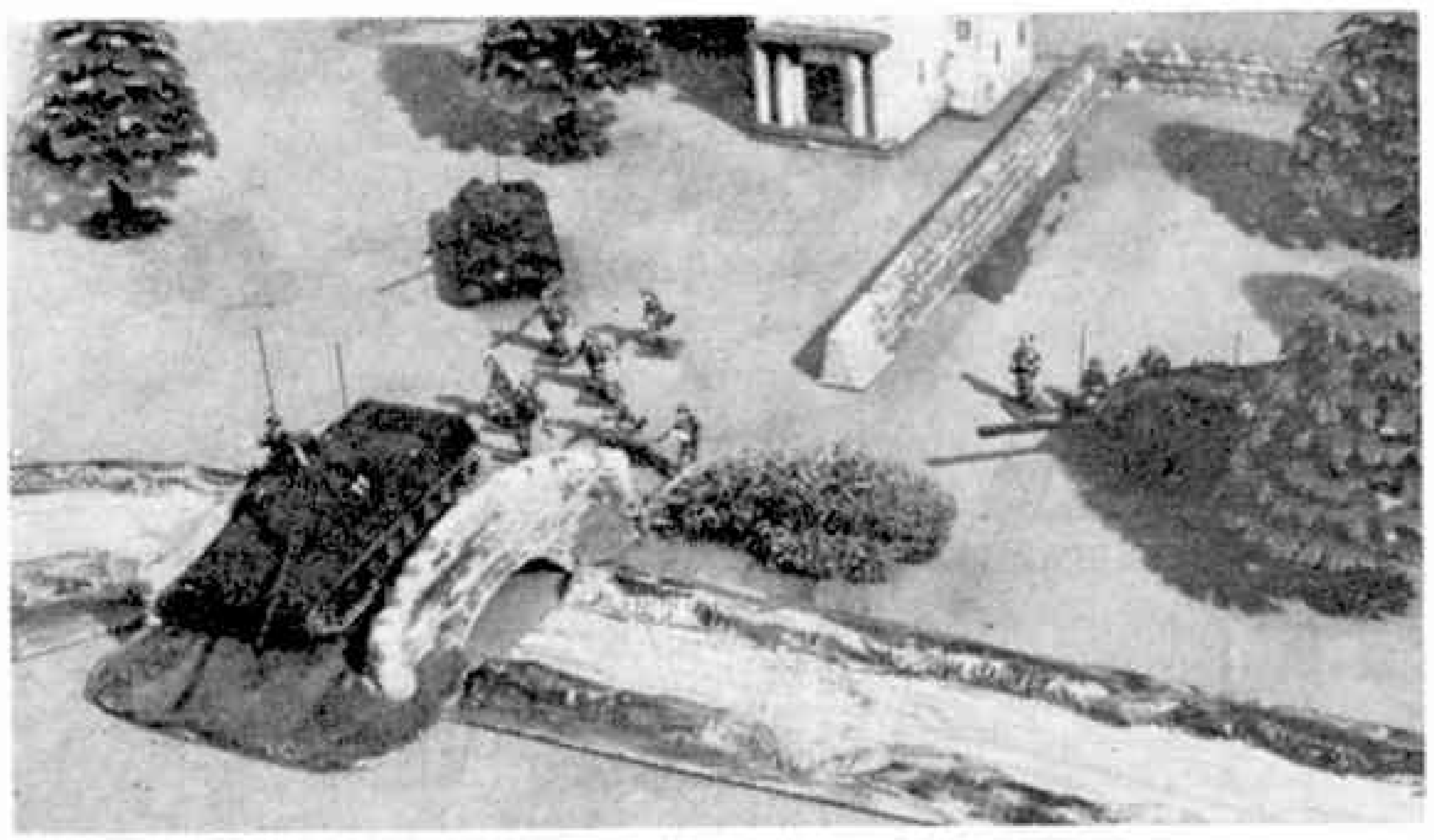


BATTLE

Part XX

Infantry H.Q. Company

by Charles Grant



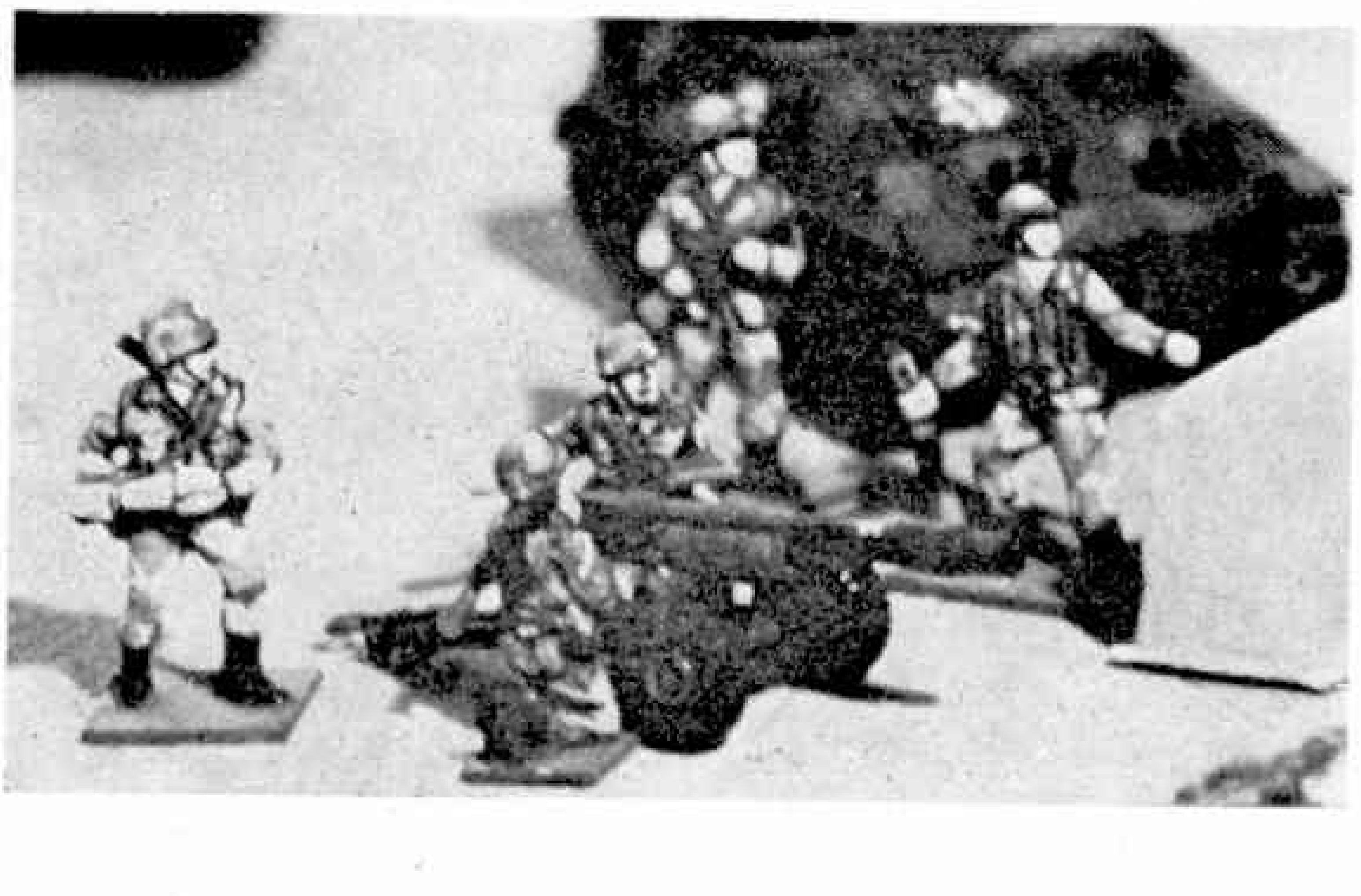
THIS WOULD seem to be an appropriate moment for completing the organisation of the Headquarters Company of our Motorised Infantry Battalion—it may be recalled that a beginning was made in Part XVII, wherein we started with the C.O.'s Command Car and the battalion radio truck. It is now incumbent upon us to add to this nucleus the various other sections necessary to establish the Headquarters Company as a viable fighting unit. Certain of these—and I make in advance due apology to them—are not really necessary for our purpose and can be dispensed with, at least for the time being. The reader could include, if he wishes, a Military Police or security section, but however essential this was in 'the real thing', I feel that we can take it that all our troops are well-behaved chaps in every way, and that no traffic control is required for them to get their vehicles round whatever obstacles might be encountered.

What I shall do then, if I may, is to set out the basic sections required to make up the company, together with the reasons for having them—their tactical necessity, that is—and follow this up with any rules for weapons not already covered in this series.

The functions of the Headquarters Company as I see them, and in accordance with which I organise my own forces, are primarily those of support, and in "The Action at Twin Farms" one was left with the suggestion that it was opportune to call for assistance, this being, of course, from the battalion headquarters company. In the present instance, the support I refer to is that contained within the actual battalion structure, ignoring for the present that provided by associated armoured or artillery units.

One of the first types of support likely to be called for by bogged-down infantry would be that provided by mortars, that is for mortars additional to those doubtless already engaged and belonging to the third section of the infantry companies. This would occur pretty frequently, and to saturate an objective with mortar bombs could be done only by concentrated and directed fire from a number of mortars. They would not necessarily be of greater calibre than the section mortar but would rely on sheer numbers to produce the desired effect. So, we can then do no better than to organise the Mortar Section of the Headquarters Company as consisting of four mortars and their requisite two-man crews—just as the infantry section mortar is operated, in fact. Much of the Mortar Section's fire will be guided—that is, with the target not directly visible, of course—and consequently a degree of signals and command organisation will be necessary, the first of such elements being the Forward Observation Officer (similar to that of the artillery battery), who will push ahead to liaise with the infantry who have asked for support, who will have the target indicated to him and who will thereupon radio back to his mortars, giving the normal directions for laying down fire as he guides it. I think it might be as well if the Mortar Section should have two officers, the F.O.O. and the Section Commander, and transport must be provided. To save on the numbers of vehicles, I feel that two mortar teams could be accommodated in one 2½-ton truck, making two for the section, and that one jeep each could be allocated to the two section officers, thus giving a grand total of four vehicles (already our transport is growing apace!). For simple convenience, I am referring throughout to Minitanks products in speaking of transport, but this is only a suggestion—there are many other types available. The jeeps—and the trucks, too—would have the inevitable 'fixed' driver, and the former would have radio antennae fitted to indicate that they were so equipped. The F.O.O.'s jeep could have an additional crew member to operate a fixed machine gun, but that is a matter of personal preference.

On to the next section, then, which will be the anti-tank one. My own choice in this matter is to make this a pretty powerful little unit, possibly more so than might be deemed correct. This I do for one reason—namely, the infantry companies are already well equipped to deal with enemy tanks (it may be recalled that the 1st and 2nd sections of each are supplied with bazookas), so, acting on the premise that, if enemy armour has broken through the bazooka barrier, or is too strong to be coped with by the infantry, then something at least moderately powerful will be required to stop the said enemy armour. Now, the choice of gun will really depend upon, first—the nationality of the player's army, if any—second, the exact power of the weapon the player wishes to employ. If British, the gun could be the 6-pounder (the Airfix one is very suitable), or possibly the 17-pounder; if German, then the 50 mm. gun might be considered appropriate, and



Our heading photo is a typical bridge assault, with armour and infantry in close co-operation.

Left: A "Do-it-yourself" 90 mm. anti-tank gun, as referred to in the text.

if Russian, the 57 mm. or the 76.2 mm. could be used. The Airfix 6-pounder needs only a little conversion to turn it into a Russian 76.2 mm., but I'm bound to confess—indeed it has probably been obvious from photographs appearing in past issues—that I simply use the untouched 6-pounder with Russian type troops. I daresay that some *were* sent as part of the military aid to Russia at some time. Anyway, that's my story! Of course, one can always 'mock' up one's own guns, and as the accompanying photograph illustrates, the most realistic appearance can be obtained with a little care and ingenuity. The gun is a 90 mm. weapon, and belongs to a wargamer whose complete organisation is based on weapons of this standard calibre.

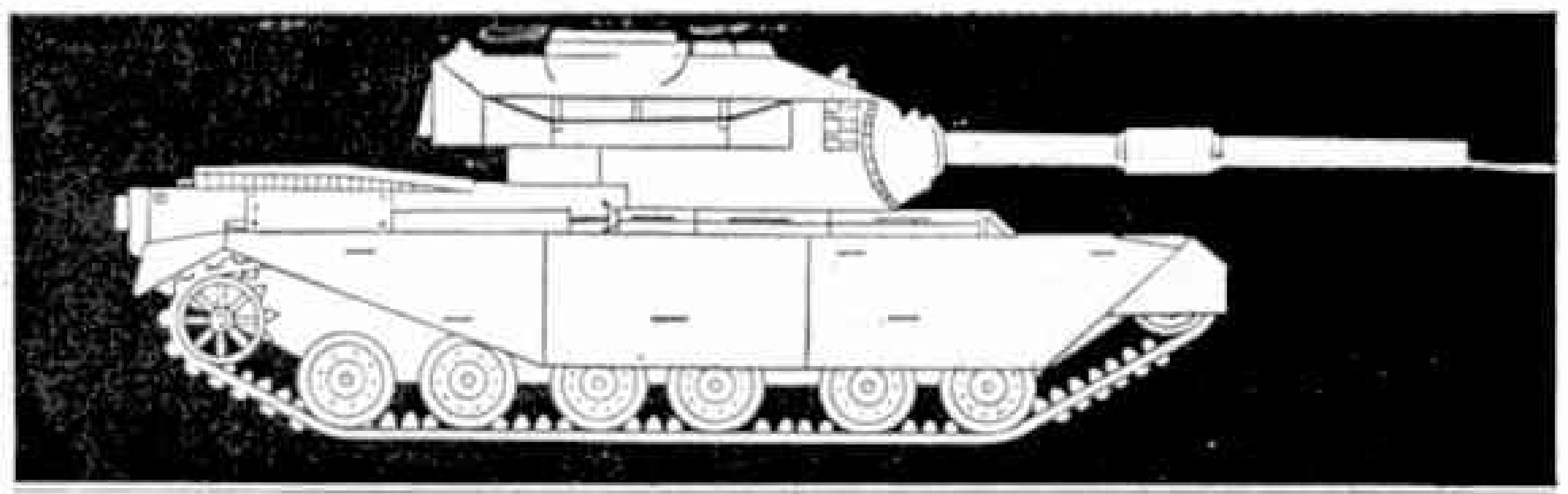
As to personnel and transport for the anti-tank guns, well, my own setup is relatively simple, consisting of—as prime movers—the ubiquitous armoured half-track, similar to that used by the infantry (mechanical uniformity always being a desirable feature), and for the crews, I think that three men to a gun should suffice, in addition to which there would be the section commander, an officer who, for reasons of economy both of finance and of room, rides in one of the half-tracks, although he could have a jeep, if the player feels generously disposed.

The heavy machine gun section is next to be reckoned with in our organisation. It has already been said that the H.M.G. is primarily a defensive weapon, used for laying down curtains of fire at long range to inhibit the movement of enemy infantry and light transport, and it is for this very good reason that it is included in the reserve sections of our battalion. The section, as we decide it should be composed, consists of four heavy machine guns and their crews—two men to each gun, naturally, plus a section commander. Again, the transport may be limited to two vehicles—2½-ton trucks or armoured half-tracks if they are available, although my own preference is for the truck. The section commander can once again—and democratically—accompany his men, in one of the section vehicles, of whichever type was chosen.

Finally, there can be added to our headquarters company a rather polyglot group, armed with miscellaneous devices and fulfilling a variety of roles, this lot being best described as the Assault Pioneer or Assault Engineer Section. In this group we shall have the engineers proper, who will lay their own mines or attempt to detect the presence of the enemy variety. A proportion of such types would be equipped with the traditional mine detector—the sort of thing that looks like a large plate attached to the end of a broomhandle. Others would have explosive charges—"Bangalore Torpedoes"—to blow up enemy barbed wire or other obstacles, to clear roads for traffic and so on. I should think that four men would be enough to be getting on with (two could be figures actually using the mine detector). The last two in the section, and indeed in the whole headquarters company, would be armed with man-pack flame throwers, whose primary employment would be to clear enemy occupied houses, pillboxes, etc. I was wrong, actually the last individual is the engineer N.C.O., who, with his men, would be accommodated in one vehicle, preferably a truck.

To recapitulate, what we have in Battalion Headquarters Company, is as follows: It turns out to be quite a convoy!

The Command Car.
H.Q. Communications Section (1 radio truck).
Mortar Section (2 trucks, 2 jeeps).
A/T Section (2 half-tracks, 2 A/T guns).
H.M.G. Section (2 trucks).
Assault Pioneer Section (1 truck).

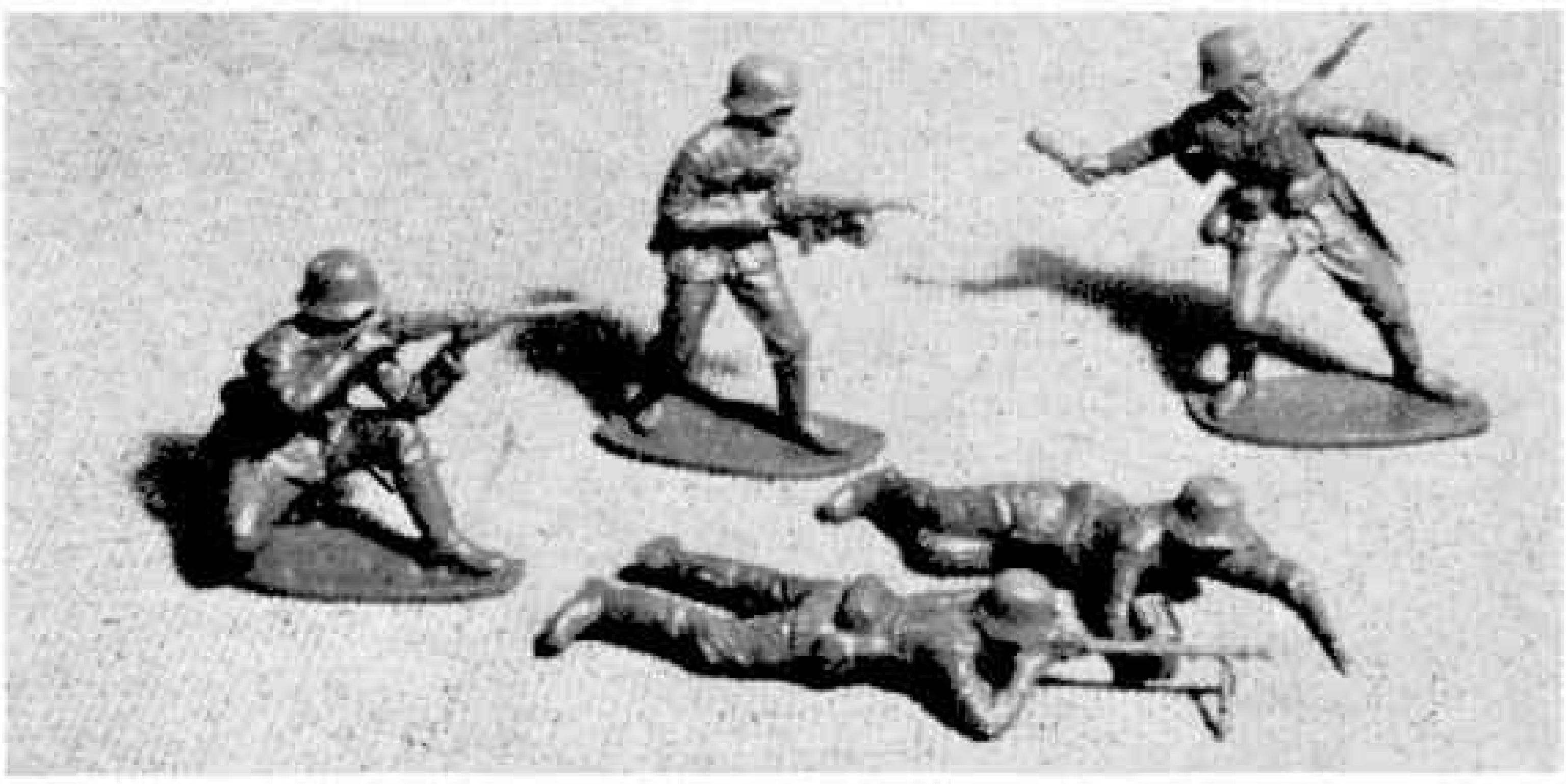


MILITARIA

A REVIEW BY CHARLES GRANT

DESIGNED AS a volume for the younger reader, "Introduction to Battle Gaming" by Terence Wise (MODEL AND ALLIED PUBLICATIONS—21/-) is a hundred-per-cent successful. It deals, in a clear and interesting way, with every aspect of wargaming and, aided by excellent photographs—these are scattered generously throughout the text—and diagrams, the writer has contrived to give a graphic and exciting account of various types of battlegames, beginning with the reconstruction of an encounter in the Punic Wars, wherein Hannibal suffers a pretty nasty defeat at the hands of his ancient enemies, the Romans. For the two other generally accepted divisions of warfare—the horse and musket, and the modern era (i.e. World War II)—similar engagements are used to illustrate the relative rules. The book is particularly readable—one is not battered with page after page of abstruse tables of this, that and the other—and it can be 'dipped into' at any point and enjoyed. In the 160 pages are included all possible hints to further one's enjoyment of the hobby, how to make terrain, and how to purchase it if time and the inclination are lacking. I was impressed with the quality of photographic reproduction, even one of 'yours truly' in his wargame room coming out very well! Obviously, such a book cannot be expected to deal in depth with every branch of wargaming, but even the most experienced of players should not find much to cause him to turn his nose up! The more youthful reader—from ten or so upwards—should find it of the greatest use, particularly the appendices dealing with information sources, books and what figures are available. The only ommission is in the last, where, under the heading "Ancient"—the well known Garrison figures are conspicuous by their absence. Otherwise—no complaints.

Converts to wargaming, when starting to organise their forces, could do no better than to seek their troops from MINIATURE FIGURINES (5 Northam Road, Southampton). I have mentioned them already in "Militaria" and now a further small selection is shown, ranging from ancient times to the Nineteenth

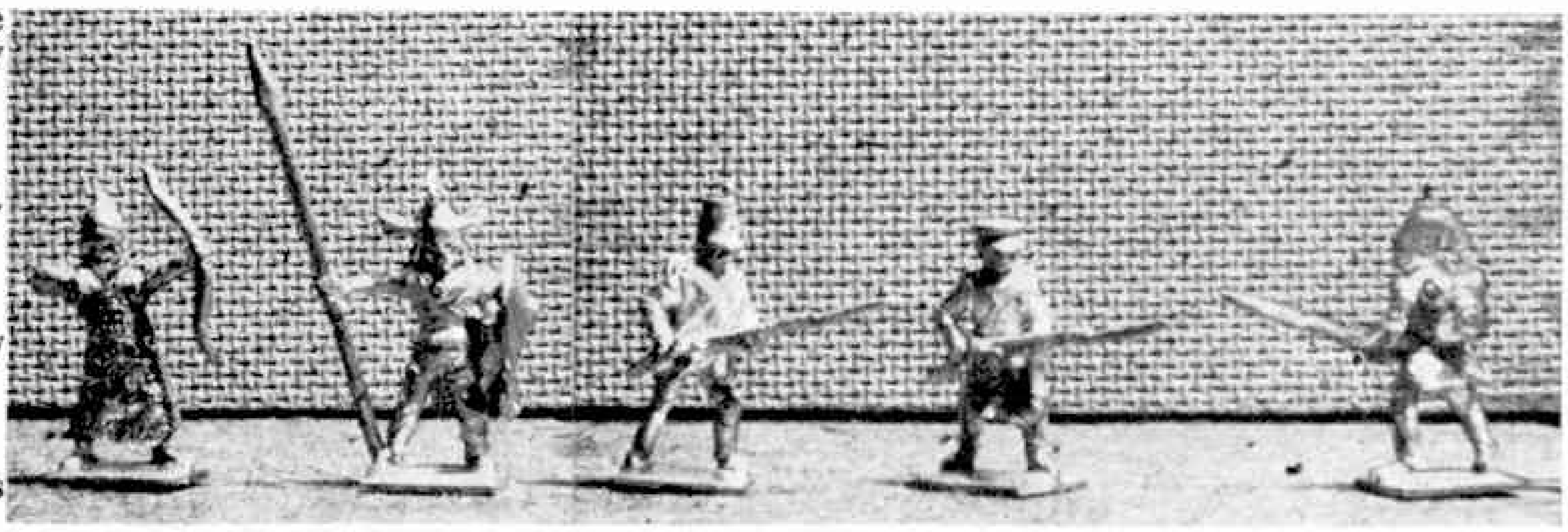


Our photo overpage shows some of the 1/32nd German Infantry by Airfix—very good moulding and well finished.

Left: A selection of the latest 20 mm. figures by " Miniature Figurines ".

Below: Another Airfix model, a very useful Roman fort.

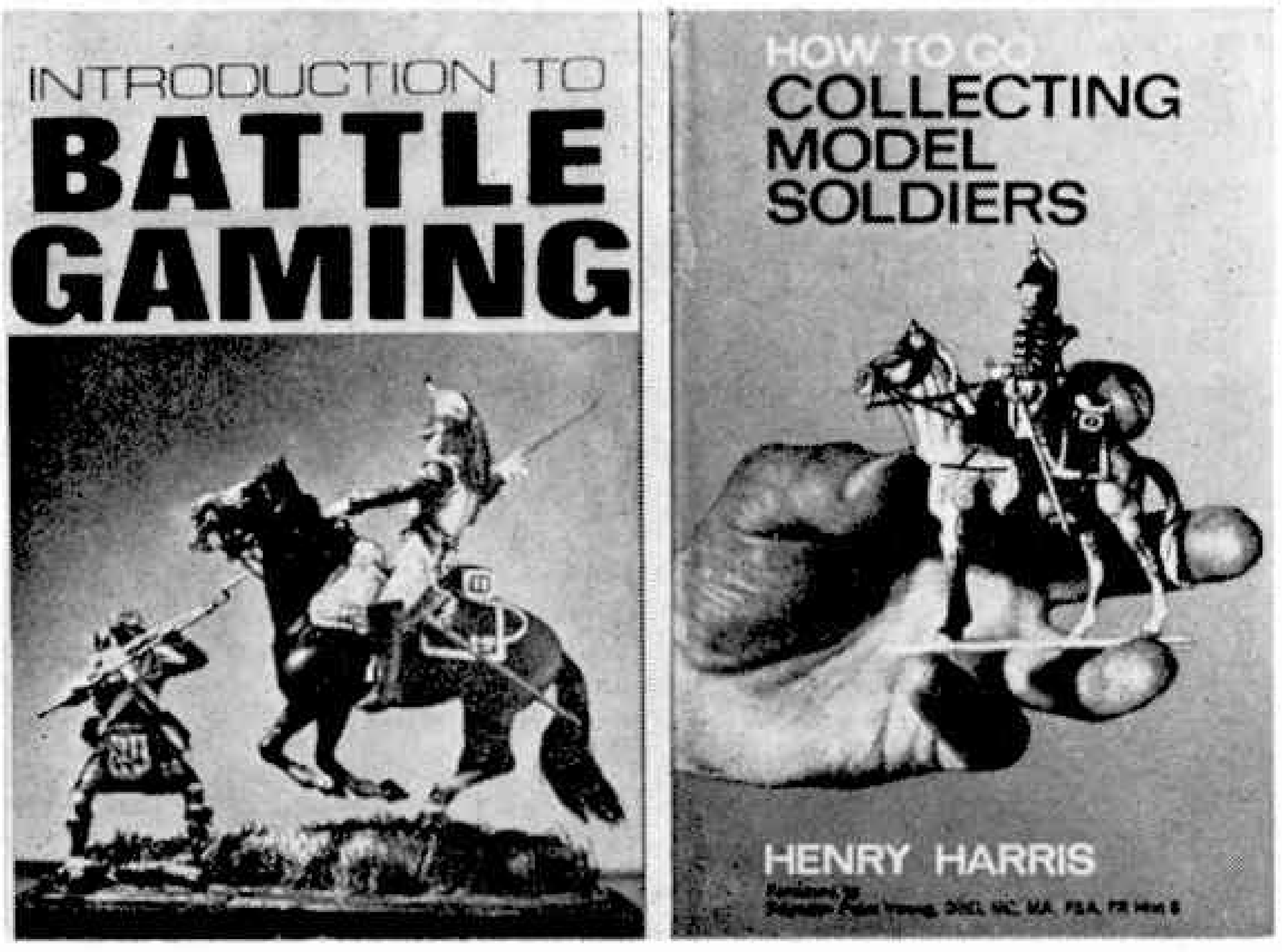
Below left: Two very interesting books by Terence Wise and Henry Harris.



Century. I say " small selection " advisedly, because the firm's latest catalogue shows a staggering range of figures, especially Napoleonic types, although the Eighteenth Century is well represented (a fact I welcome most of all). I'm glad, too, to record that the quality of the newer figures is higher than ever and they stand favourable comparison with anything you care to name. I was much taken with some 1870 types —Franco-Prussian War—which I thought were little gems and should do a lot to popularise this little known wargaming era.

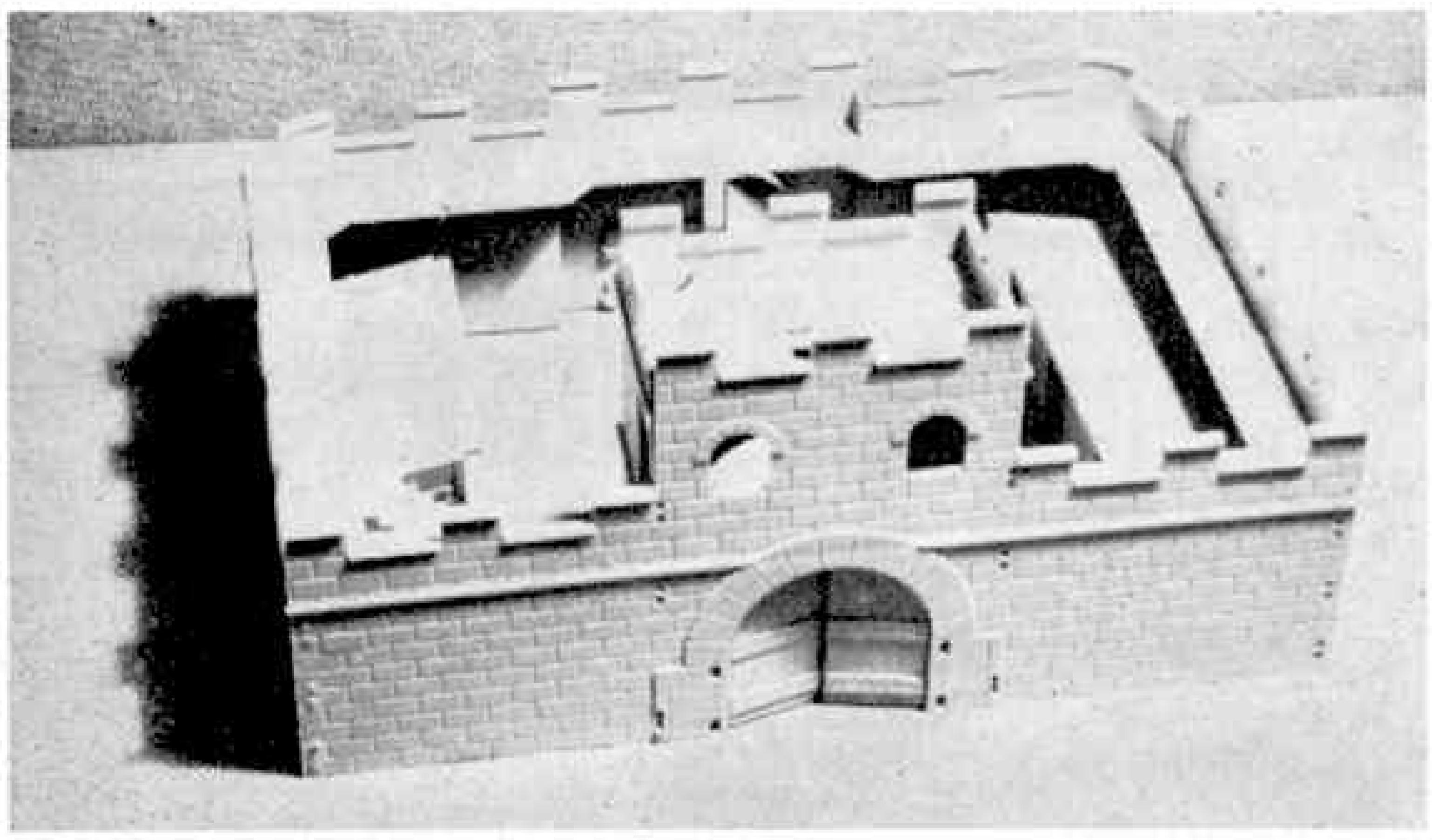
At 7/6 the Roman Fort by AIRFIX LTD.—similar to those which studded Hadrian's Wall—is good value. (It can also be purchased complete with boxes of Romans and Ancient Britons for 12/6). The Fort covers an area of about 9 by 7 inches and has interior buildings and openable gates, the whole thing being clipped together as a temporary affair (to be dismantled between sieges) or it can be glued together permanently. I can see it being of great use in 'ancient' wargames and feel that it will be used in many other climes than those experienced along the Wall. Incidentally, it's worth devoting some little time to painting the Fort, its appearance can be enormously enhanced thereby.

Also from AIRFIX come sets of $\frac{1}{32}$ scale soldiers in plastic—the 54 mm. scale—Germans, U.S. Infantry and Paratroopers, which I heartily recommend for the younger enthusiasts. About 20 or so figures at 5/11 can be considered a bargain, particularly because of the high quality of moulding, facial expresion and uniform and equipment detail. Indeed, given a little sunshine, a couple of $\frac{1}{32}$ scale tanks or something similar, and a stretch of lawn—even the least hardy of wargamers could have a first rate garden game—doubtless to the amazement of the neighbours! I suggest this because, alas, such figures are far too big for any conceivable wargame table, short of something set up in the local church hall. The photograph shows a few of the German types—even unpainted they look great, don't they?



I was delighted to learn the other day (from HUMBROL NEWS) that the tinlets in the three Authentic Military Colours sets (Combat Uniforms, Ceremonial Uniforms and Military Equipment) may now be purchased separately at 1/9 per tinlet. This is great news, because certain of the colours were always being used up more quickly than others, and to spend about ten shillings just to get one tin was a bit much. Scarlet, 'leather' and gunmetal seemed to be used up very rapidly, the first named being a splendidly bright red, best there is.

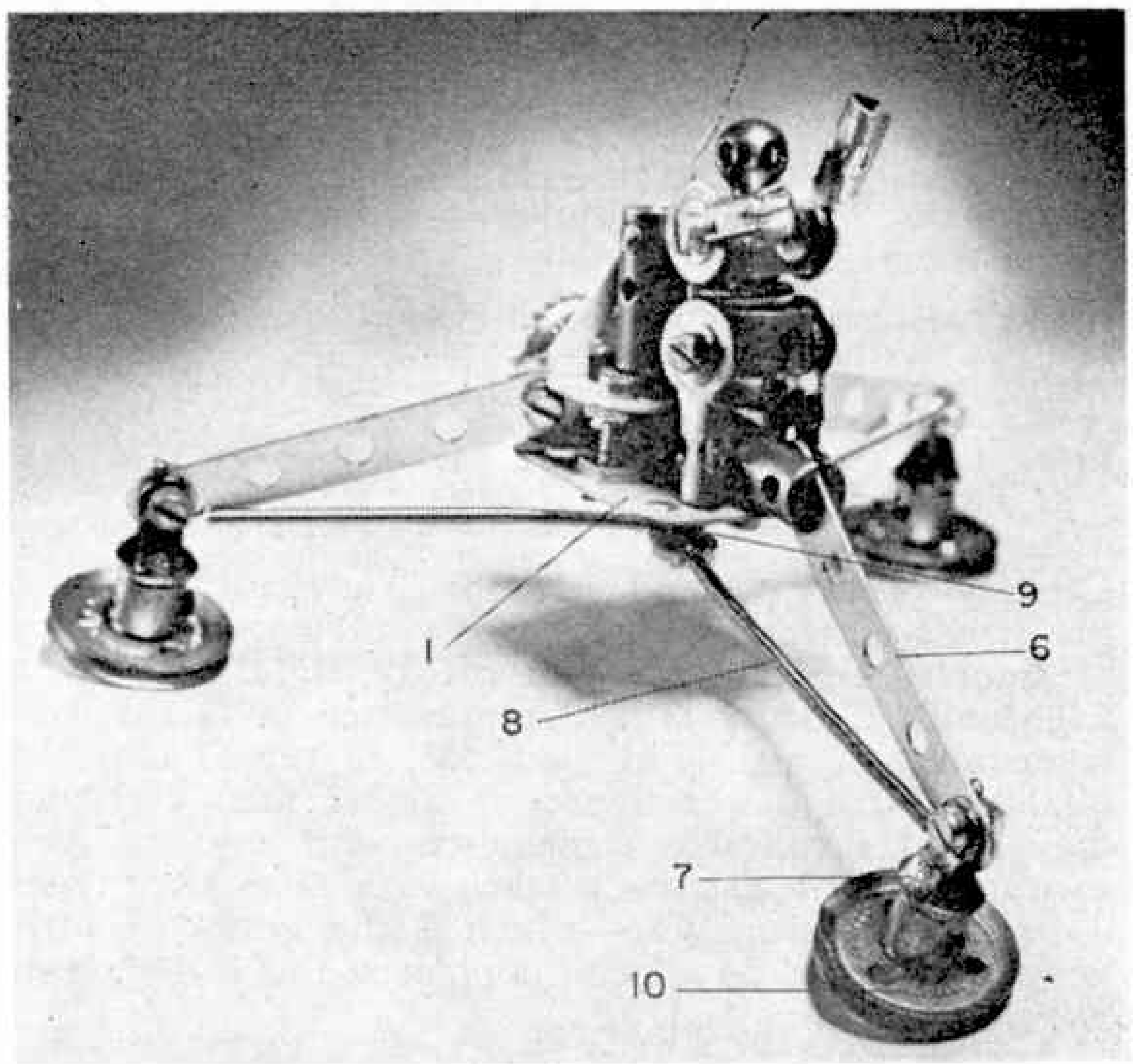
Major Henry Harris is a well-known writer on the model soldier hobby, and is an experienced soldier himself. His latest book—" How To Go Collecting Model Soldiers " (PATRICK STEPHENS LTD., 9 Ely Place, London, E.C.1)—reflects both his profession and his erudition. This very competent work covers the gamut of the hobby from 'A' to 'Z', dealing with the craftsman-made figure and with that produced 'at home', while conversion and casting are most lucidly explained. Inevitably, the author concentrates on his own favourite types, but the reader can easily forgive this small bias. A feature of the book is the vast number of illustrations, photographs of individual figures, displays and dioramas being abundant. Included is a chapter on wargaming by Donald Featherstone, and very exhaustive appendices give details of manufacturers and their products, lists of books, museums and so on. The volume is a solid one, with plenty of reading in it—worth the 35/- it costs without a doubt.



On the subject of books, the Autumn and Winter 1969 List from ARMS AND ARMOUR PRESS (677 Finchley Road, N.W.2) contains a tremendous number of really mouth-watering items, ranging from a reprint of H. G. Wells' " Little Wars " to " Badges of the British Army 1820-1960 " by F. J. Willinson. Also listed for publication are studies of the Churchill tank by Peter Chamberlain and Chris Ellis and " British Generalship in the Twentieth Century " by Major General Sixsmith. Great stuff, all of it!

MOON BUG

A simple but effective model built by 12-year old Gianguido Servetti, and described for us by Spanner

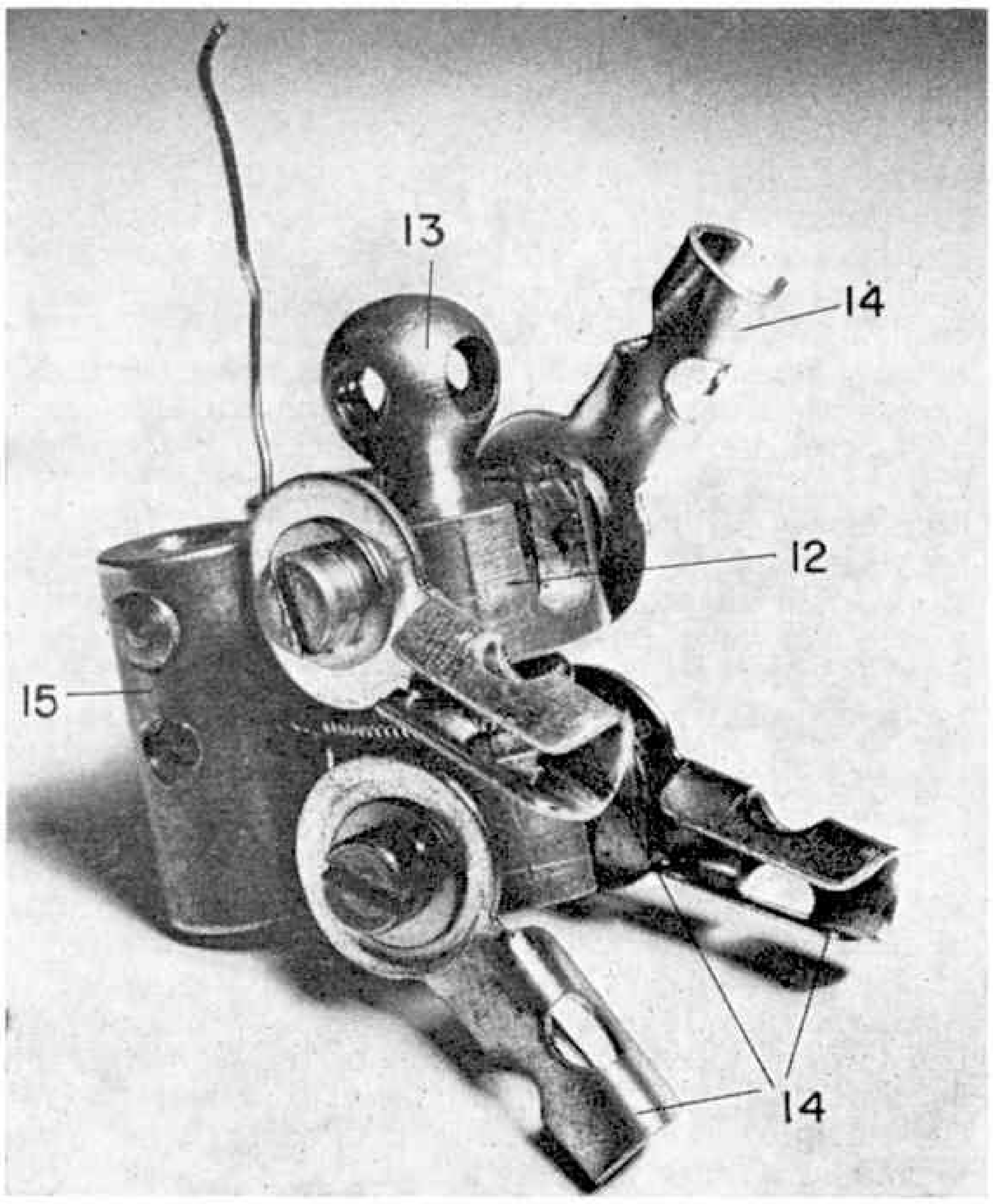


I'VE SAID it before and I'll say it again, there's something fascinating about simplicity models in Meccano!

As far as Meccano is concerned, simplicity models are those which, while retaining a high degree of realism, are produced from the minimum possible number of parts or, in other words, they are small, easy to make and look great! They certainly appeal to most people, no matter what their age or nationality. Only last month, for instance, we featured a little 3-wheel car built by an adult reader in this country and now, this month, we have a delightful, space-age " Moon Bug "—with astronaut—built by a young Italian enthusiast, 12-year-old Gianguido Servetti of Piacenza, Italy, the son of the very well-known Meccanoman, Guiseppe Servetti. Considering Gianguido's age, his model is really first class which makes me think that the flair for Meccano modelling runs in the whole Servetti family!

As far as construction is concerned, the actual " bug," itself, is produced from a 2½ × 1½ in. Flat Plate 1, in the centre hole of which a ½ in. Bolt, shank downwards, is held by a Nut. The counter springs for the legs will later be secured to this Bolt, but, first, the body should be completed. A slotted Coupling 2, carrying a 2 in. Rod in its longitudinal bore, is bolted to the upper face of Plate 1, as also are one right-hand Corner Angle Bracket 3 and one left-hand Corner Angle Bracket 4, angled as shown, with one Bolt securing both Brackets. A Trunnion 5 is then fixed on ½ in. Bolts held in the Plate by Nuts.

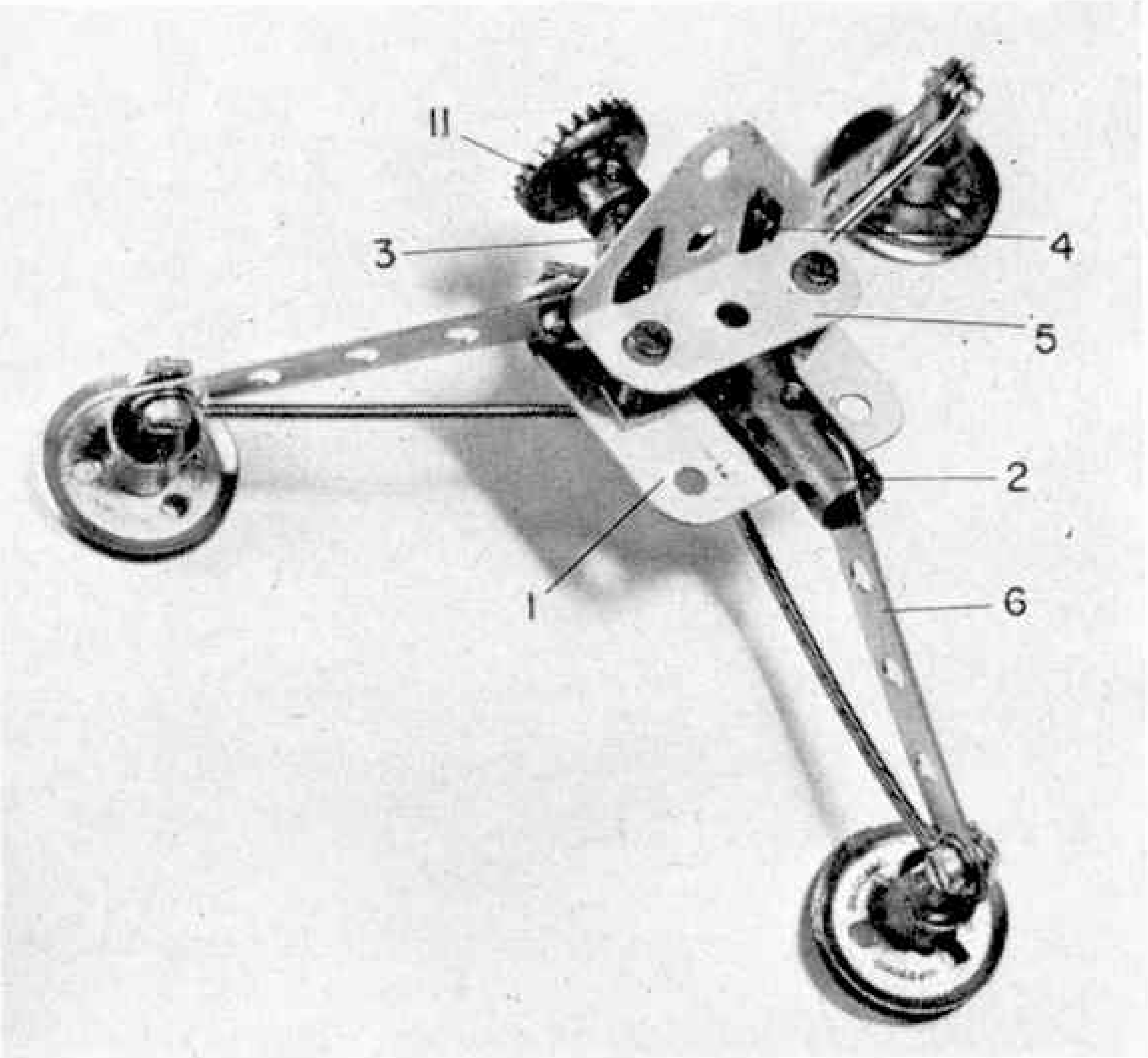
The three legs are now added, each being supplied by a 2½ in. Narrow Strip 6, one pivotally attached to Slotted Coupling 2 and the remaining two lock-nutted to Corner Angle Brackets 3 and 4. Attached to the lower end of each Strip is an End Bearing 7, the



Above: This delightful little " Moon Bug " complete with its astronaut pilot, was built by 12 year old Gianguido Servetti of Piacenza, Italy. It just goes to show that a model does not have to be intricate to be effective.

Left: The astronaut in his suit and helmet, equipped with oxygen pack.

Overpage: A view of the bug with the astronaut removed to show the pilot's seat.



securing Bolt also holding one end of a short length of Spring Cord 8 in place. The other end of this Spring Cord is secured to the $\frac{1}{2}$ in. Bolt in the centre hole of Plate 1 by being trapped under a Cord Anchoring Spring 9 fixed on the shank of the Bolt by a Washer and a Nut. A 1 in. Pulley without Boss 10 is mounted on a $\frac{1}{2}$ in. Bolt held in the boss of each End Bearing, then, to complete the "bug", a $\frac{3}{4}$ in. Contrate Wheel 11 is fixed on the end of the Rod held in Strip Coupling 2 to represent a rocket engine.

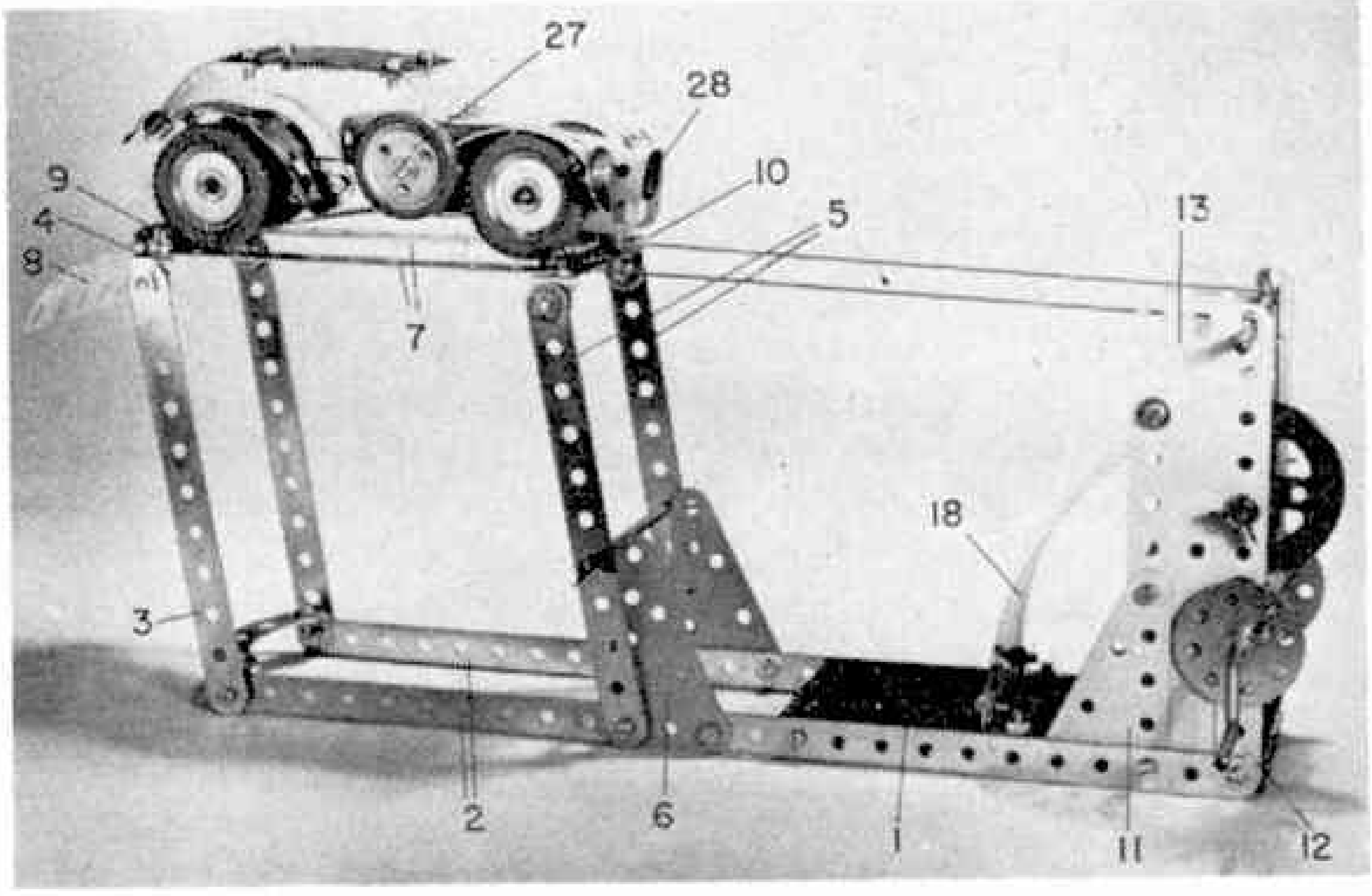
Trunnion 5 in the "bug" serves as the seat for the "Astronaut", who is built up from a Socket Coupling 12, in the upper end of which a Handrail Coupling 13 is held. Four Rod and Strip Connectors 14 are bolted, as shown, to the sides of the Socket Coupling, two to represent arms and two to act as legs. On the original model, Elektrikit Thin Washers were fitted under the heads of the securing Bolts here for effect, but these are not necessary, of course.

An interesting oxygen back-pack is built up from two Threaded Couplings 15, held together by a 1 in. Rod fixed in the upper transverse bores of the Couplings, and it is held in place on the astronaut by a belt supplied by a length of Spring Cord passed round the waist of Socket Coupling 12 and held in the centre transverse bores of Couplings 15. Finally, the radio aerial shown in the photographs is a (rather battered) piece of ordinary stiff wire wedged between the astronaut and his back-pack. It's simple, but it adds the final touch to a fascinating little model.

PARTS REQUIRED

1—17	**1—38**	**2—111c**	**1—171**
1—18b	**1—58**	**1—126**	**1—176**
3—22a	**1—63b**	**1—136a**	**4—212**
1—29	**2—63c**	**1—154a**	**1—235**
16—37a	**1—74**	**1—154b**	**4—561**
8—37b	**6—111a**	**3—166**	

MECCANO CAR RAMP



Yet another simple model. This car ramp and its unusual car can both be built from outfit No. 3

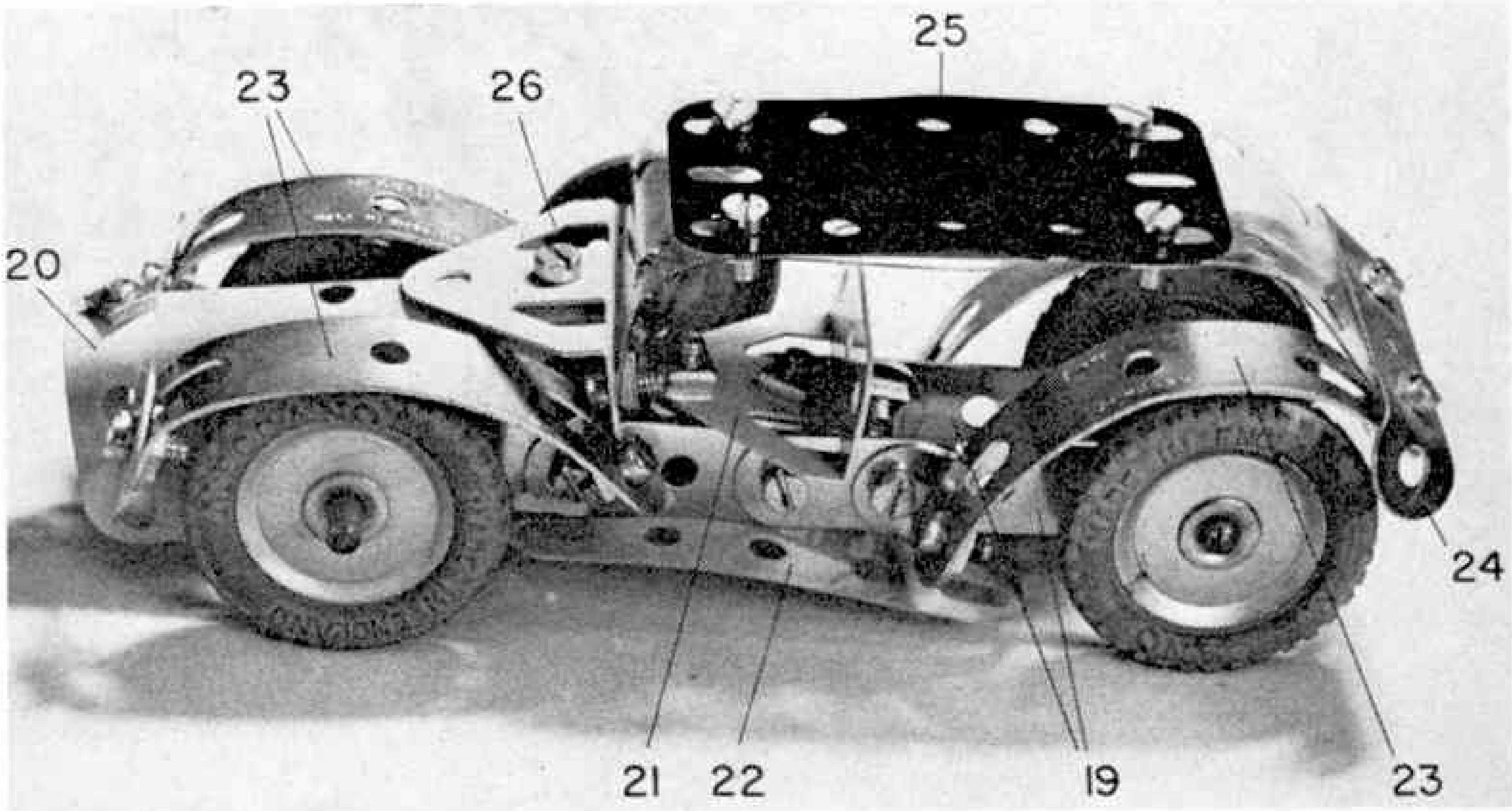
ONE OF the most essential pieces of servicing equipment in any garage is the car ramp or lift on which a car is raised to allow easy access to its underside. Every garage and service station handling car repairs and maintenance is equipped with a ramp of some sort or, at the very least, an inspection pit, the latter serving the same purpose as a ramp except that, instead of lifting the car up, the mechanic goes down and under. Described here is a simple Meccano Car Ramp and a Car to go with it, both of which are built from the No. 3 Set. Admittedly, it does not work in exactly the same way as a real-life ramp, but it still makes a very interesting model.

As far as construction is concerned, a $5\frac{1}{2} \times 2\frac{1}{2}$ Flanged Plate 1 is extended by two $12\frac{1}{2}$ in. Strips 2, to the end of each of which a $5\frac{1}{2}$ in. Strip 3 is lock-nutted, the locking Nuts also fixing an Angle Bracket to each Strip. These Angle Brackets are connected by a $2\frac{1}{2}$ in. Stepped Curved Strip, while lock-nutted between the ends of Strips 3 is a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 4. Two more $5\frac{1}{2}$ in. Strips 5 are lock-nutted to Strips 2, the locking Nuts in this case helping to fix two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 6 in position, then the upper ends of the Strips are also

Heading: The finished ramp, complete with car. Although unorthodox, the model does work and proves itself to be an interesting construction.

Right: This uncomplicated car was designed specifically for use with the Car Ramp.

Below right: A close-up view of the control gear used to raise and lower the ramp.



connected by a 2½ × ½ in. Double Angle Strip, lock-nutted in place. Bolted between this Double Angle Strip and Double Angle Strip 4 are two further 5½ in. Strips 7, the securing Bolts, in the case of Double Angle Strip 4, also holding a 2½ × 2½ in. Curved Plate 8 and a 2½ in. Stepped Curved Strip 9, the former spaced from the Double Angle Strip by two Washers on each Bolt. Another 2½ in. Stepped Curved Strip 10 is similarly spaced from the other Double Angle Strip.

Secured to the side flanges of Plate 1, at each side, are a 2½ × 1½ in. Triangular Flexible Plate 11, a 2½ in. Strip 12 and a 5½ × 1½ in. Flexible Plate 13 in which are journalled a 4 in. Rod 14, a 3½ in. Rod 15 and a 3½ in. Crank Handle 16. Rods 14 and 15 are held in place by Spring Clips, whereas Crank Handle 16 is held by two 8-hole Bush Wheels. Mounted on Rod 15 is a 2 in. Pulley 17, connected to Crank Handle 16 by a 2½ in. Driving Band. The ramp is raised and lowered by two identical lengths of Cord secured to the upper front corners of the ramp and wound round Rod 15. When Crank Handle 16 is turned, the ramp should rise, being prevented from travelling too far by a 3½ in. Rod, held by Spring Clips in Strips 5, striking against Triangular Flexible Plates 6. Attached by Angle Brackets to Flanged Plate 1 is a 5½ × 2½ in. Flexible Plate 18, this also being attached by a further two Angle Brackets to Flexible Plates 13.

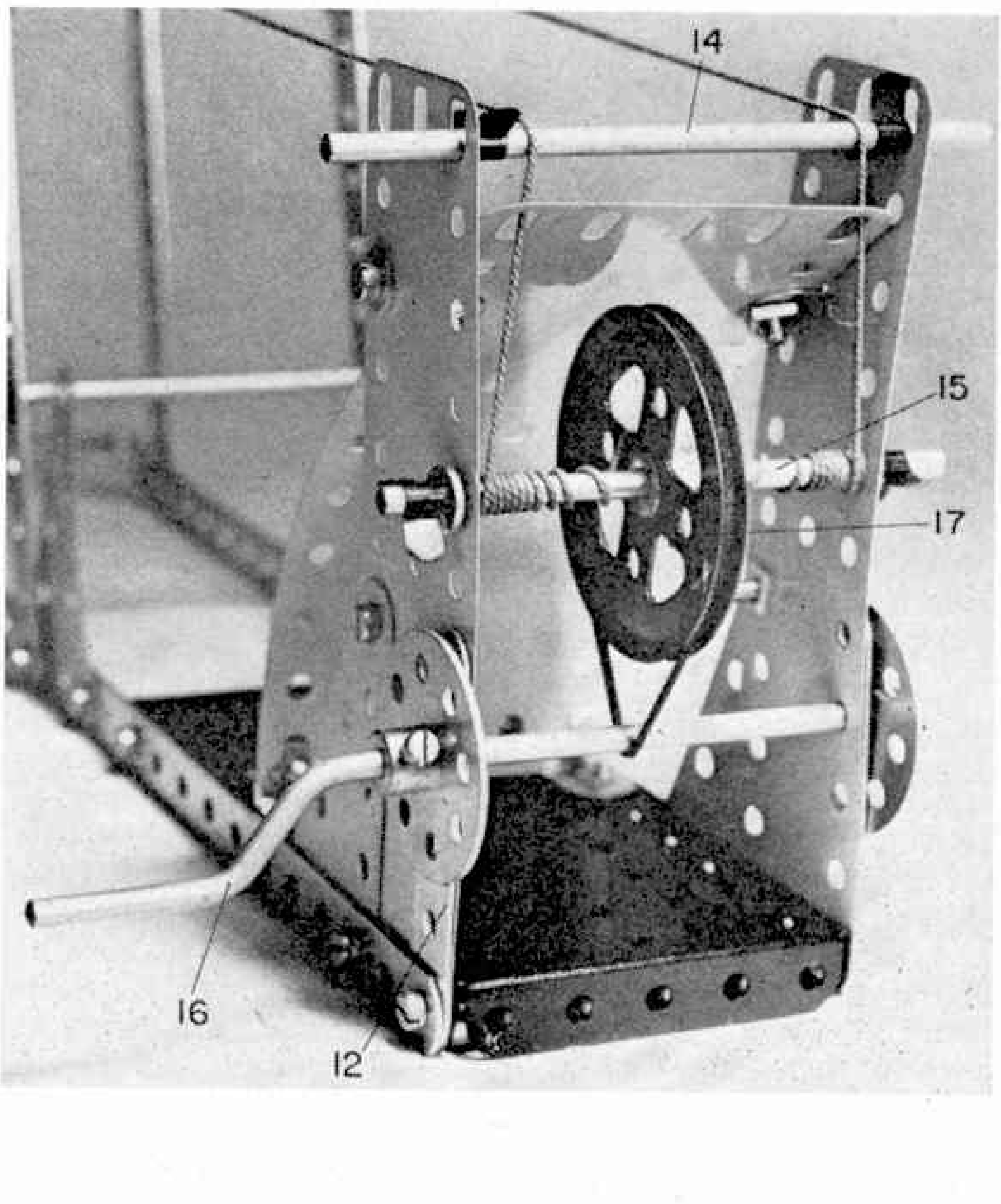
The car which goes with the ramp is extremely simple in design consisting of two 4 in. compound strips 19, built up from 2½ in. Strips and joined by a "U"-section Curved Plate 20 and a Double Bracket to which a Trunnion 21 is bolted to serve as the seat. Bolted to the apex hole of the Trunnion is a ½ in. Reversed Angle Bracket, to the lower lug of which a 2½ × 1½ in. Flexible Plate 22 is secured. The mudguards are represented by Stepped Curved Strips 23 attached to compound strips 19 by Angle Brackets in three cases and by a ½ in. Reversed Angle Bracket in the fourth (right-hand front) case.

Attached to the rear mudguards is a 2½ × 1½ in. Transparent Plastic Plate edged by a shaped 2½ in. Strip 24, the latter serving as the rear bumper. The Transparent Plate is bolted to the roof—supplied by a 2½ × 1½ in. Plastic Plate 25 on top of a 2½ × 1½ in. Flexible Plate for rigidity—the windscreen also being bolted to the other end of the roof. Another 2½ × 1½ in. Transparent Plastic Plate serves as the windscreen, by the way, its lower edge being secured to a Trunnion 26 bolted as shown to "U"-section Plate 20.

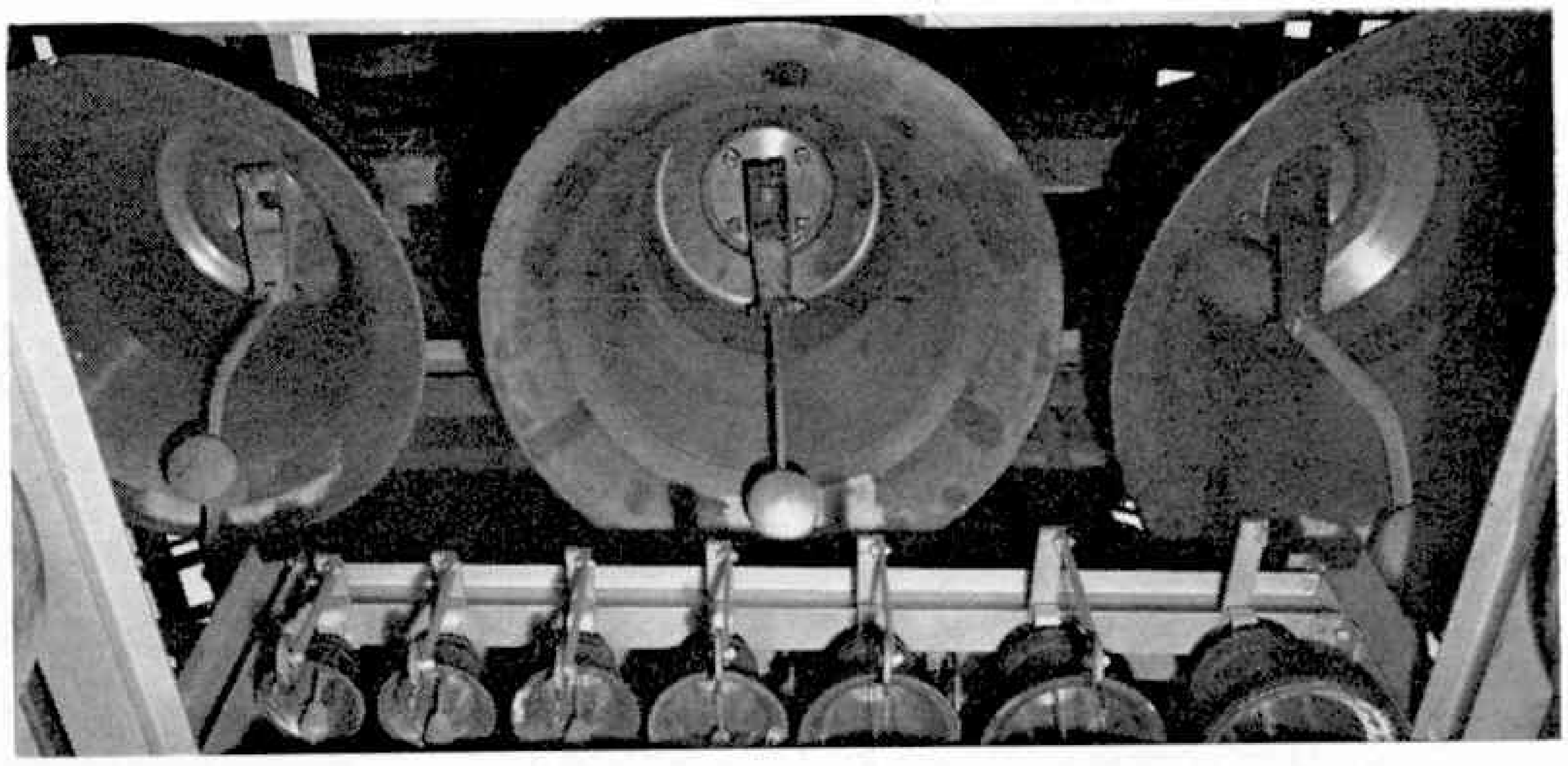
All four road wheels are supplied by 1 in. Pulleys fitted with Motor Tyres, the front wheels being carried on a 2 in. Rod journalled in Plate 20 and the rear wheels on a 1½ in. Rod journalled in strips 19. An imitation spare wheel 27, represented by a 1 in. Pulley without boss fitted with a Rubber Ring, is bolted to the free lug of the Reversed Angle Bracket securing the right-hand front mudguard in place. Headlamps are supplied by ¾ in. Washers bolted to the front mudguards and, last of all, an Angle Bracket 28 is bolted to the front of Plate 20 to serve as a radiator-grille.

PARTS REQUIRED

2—1	1—19s	2—38d	1—186
6—2	1—20a	1—40	2—188
7—5	4—22	2—48a	2—189
1—11	1—22a	1—52	1—192
10—12	2—24	3—90a	2—193
1—15b	6—35	6—111c	1—194
2—16	60—37a	2—126	1—199
1—17	53—37b	4—142c	1—200
1—18a	10—38	1—155	4—215



RINGING IN CHRISTMAS



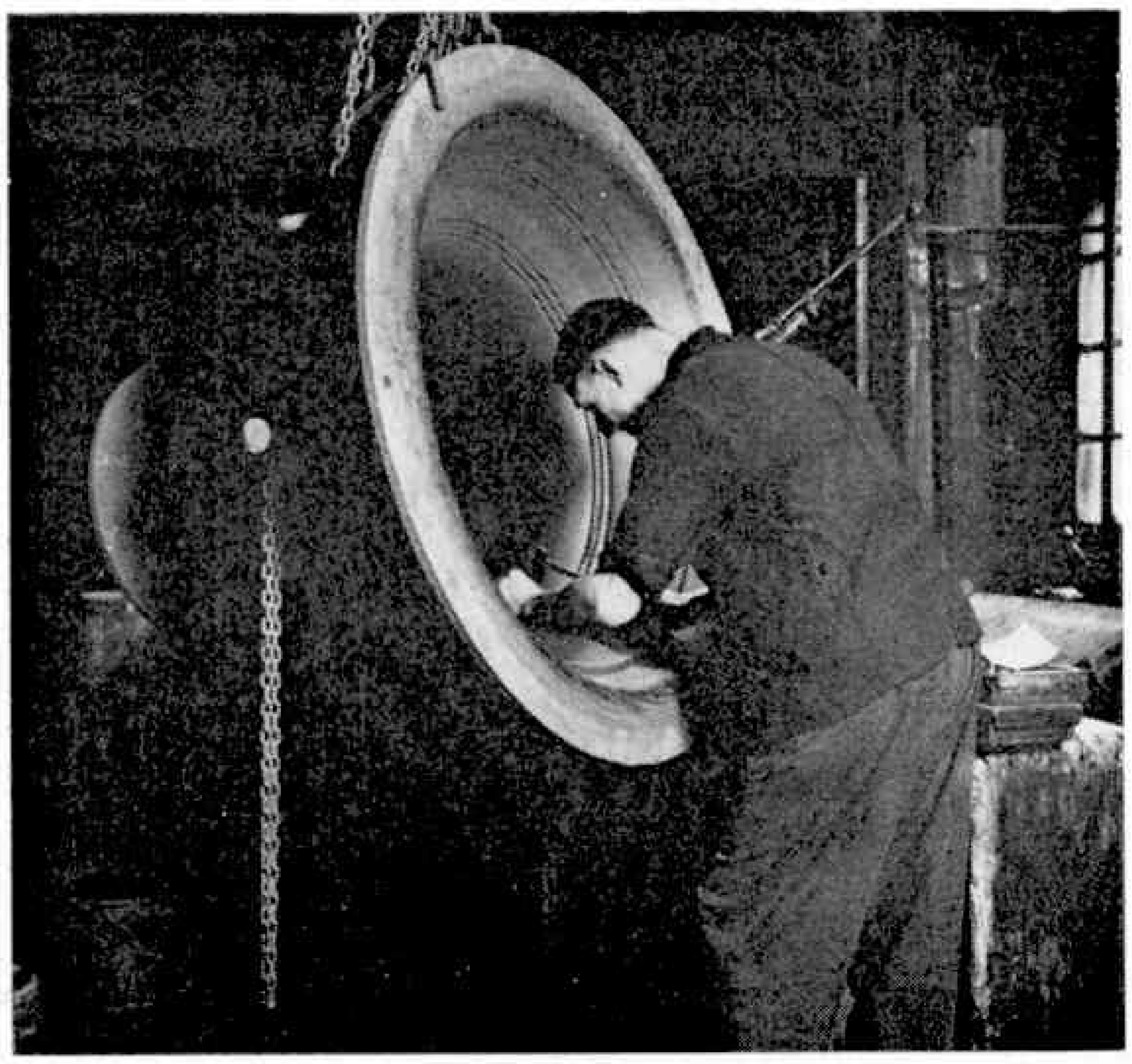
Every Christmas church bells all over the world ring out their glad tidings. **Arthur Turner** tells readers of the fascinating history behind these centuries old symbols.

IT'S A Christmas truism that the annual festival would give less enjoyment if it lost its joyous church tower peals. They ring out glad tidings of the Nativity and draw attention to many interesting bells.

Bell-ringing, indeed, has been practised in Britain for hundreds of years. The oldest church bells in our country today were cast in the thirteenth century, and they are distinctive because they survived both the avarice of Henry the Eighth (who ordered the melting-down of monastic bells) and the zeal of the Puritans, who generally disfavoured bell-ringing.

The difficulty of reaching the bell chambers, however, saved a good many bells from destruction in Commonwealth times, and they were put out of action merely by cutting off the ropes. So, although present-day students of campanology may find it irksome to have to climb into dark and dusty belfries, if these had been more accessible in bygone days there is little doubt that fewer bells of interest would exist today.

The earliest example in Britain bearing a date (1296) is in Claughton Church, Lancashire, but an undated one at Caversfield, Oxfordshire, is almost certainly older still. Its age is revealed by curious style of lettering used in an inscription which it bears, and by a reference to a Hugh Gargate and his wife who lived nearby between 1207 and 1219.



Oxfordshire has another ancient bell at Goring-on-Thames. It bears an inscription in the form of a prayer for the soul of Peter Quivei, Bishop of Exeter about 1290.

Bell-casting, in fact, is the oldest example of heavy industry in Britain. The earliest procedure was to set up a forge beside the church requiring bells. Evidence of this has come to light during excavations, when clinker and other debris has been found.

Several sites where bells were cast have been discovered close to York Minster during the recent reconstructural work there, and references to itinerant bell-founders occur in churchwardens' accounts at various other places.

In time, however, it became customary to cast church bells at specially equipped foundries in a few centres, and to transport the finished products to their destinations by river, road and sea.

Two large and well-known bell-casting concerns function today at Loughborough (Leicestershire) and London respectively. Bells from these centres ring out at Christmas in churches all over the world and are heard on many other occasions.

The London bell foundry, in Whitechapel, has had an unbroken history from the early years of Queen Elizabeth Tudor's reign, having developed from a small one established at that time by a metallurgical craftsman named Robert Mot.

He supplied bells for many London churches, and although most of them were destroyed in the Great Fire of 1666 or in the blitzes of World War II, some still survive. Westminster Abbey retains two Mot bells, and another is in St. Mary's Church, Wimbledon. Six other bells in Westminster Abbey were also cast in Whitechapel, betwen 1583 and 1919, and were rehung a few years ago.

Hundreds of bells have been sent overseas from London and Loughborough, especially to Canada and the U.S.A. The biggest shipment of bells from Britain during the last forty years was a consignment of 53 from Loughborough to Washington, D.C for the National Episcopal Cathedral there.

More than 45 tons of copper and nearly 15 tons of tin were needed for this carillon. The smallest weighs a mere 20 lb. and the largest (8 ft. 8 in. in diameter) scales 10½ tons.

A singular history is attached to a ring of eight bells cast in 1764 at the Whitechapel foundry for a church at Charleston, South Carolina. They were brought back to England as booty when the American city was captured during the War of Independence, but were redeemed later by a wealthy American merchant and rehung in the Charlston church. When the War of Sucession broke out just over a century ago the bells were removed to Columbia as a safety measure. Unfortunately the precaution proved to be ill advised, for Columbia was burned and the bells perished in the blaze.

There is still another chapter in the story, however, for some of the metal was recovered and sent to Whitechapel, were it was incorporated in a new ring for the Charleston church.

Recovering bell metal from gutted church towers, so that it can provide some material for new bells, has since become almost commonplace. The practice has been adopted in casting new bells for churches blitzed in World War II.

London's celebrated Bow Bells, originally made at the Whitechapel factory in the mid-eighteenth century, have been recast there since they were victims of an air raid in 1941.

Another famous ring restored since its setting suffered heavily from bombs now hangs again in St. Clement Danes Church, in the middle of the Strand, London. Oddly the only bell in this church to escape serious damage was the clock bell, and a further point of interest is that this bell was made at the foundry of Robert Mot, the craftsman who pioneered bell-founding in Whitechapel.

Many secular bells, including commemorative ones, have come from the centre or from the Loughborough foundry. The most famous examples are Big Ben (the name really applies to the bell and not to the clock) and the Liberty Bell now in the U.S.A.

The Liberty Bell—officially the State House Bell—was ordered from a Whitechapel Road foundry in 1752 and was sent to Philadelphia to be rung at the public declaration of the Act of Independence on the 4th July, 1776. A crack appeared soon after the bell reached its destination, and experienced investigators reported that the metal alloy was too brittle. Two local metallurgists were commissioned to recast the bell, using a tougher alloy. The result, however, was unsatisfactory, and a second attempt to remedy matters was made. Even this effort was far from successful, but the bell was nevertheless hung in the State House steeple. It was tolled at the death of Chief Justice John Marshall in 1835—and it cracked again! Eleven years later efforts were made to restore the tone by slightly increasing the width of the crack, but once more success was elusive, and the crack was seen to be spreading.

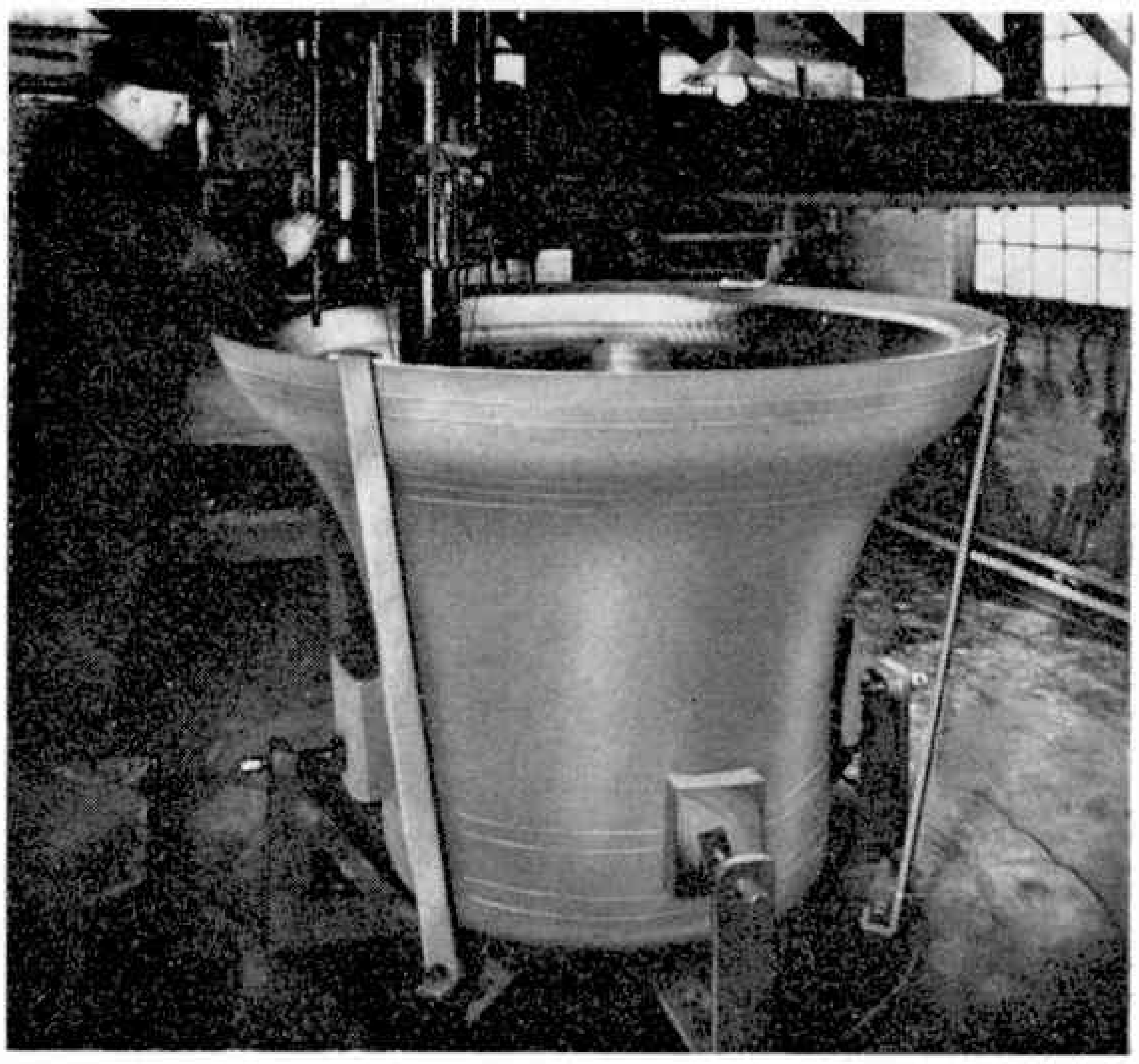
After ringing for Washington's birthday the bell was "retired" and has never been properly rung since. It now stands in Independence Hall, Philadelphia.

An interesting sequel to this facet of bell-ringing brings its story up-to-date. To mark the bicentenary of the Declaration of Independence, in 1976, 2,400 one-fifth scale models of the Liberty Bell, each mounted on a presentation stand, are being being produced at the Whitechapel foundry. The first of them was presented to the Governor of Philadelphia last June.

It would be tempting to say that bell-founding methods have gone unchanged down the years, and that modern bells are made in the way they were produced hundreds of years ago, for it seems like this to the layman. An instruction book for making and tuning bells was written about 700 years ago by a monk of Evesham, and the principles are applicable today.

But modern materials and production engineering techniques have transformed the process from a craft into a science. For instance the slurry used in bell-making is scientifically prepared, and wetting and antifoaming agents are added—improvements which the medieval bell producers never attempted.

The peals that ring out their glad tidings this Christmas thus have an absorbing history. Moreover, Britain's bell-founders can rightly claim to have enabled many countries to celebrate the Nativity in this particular way, by providing bells for belfries and carillon towers all over the globe.

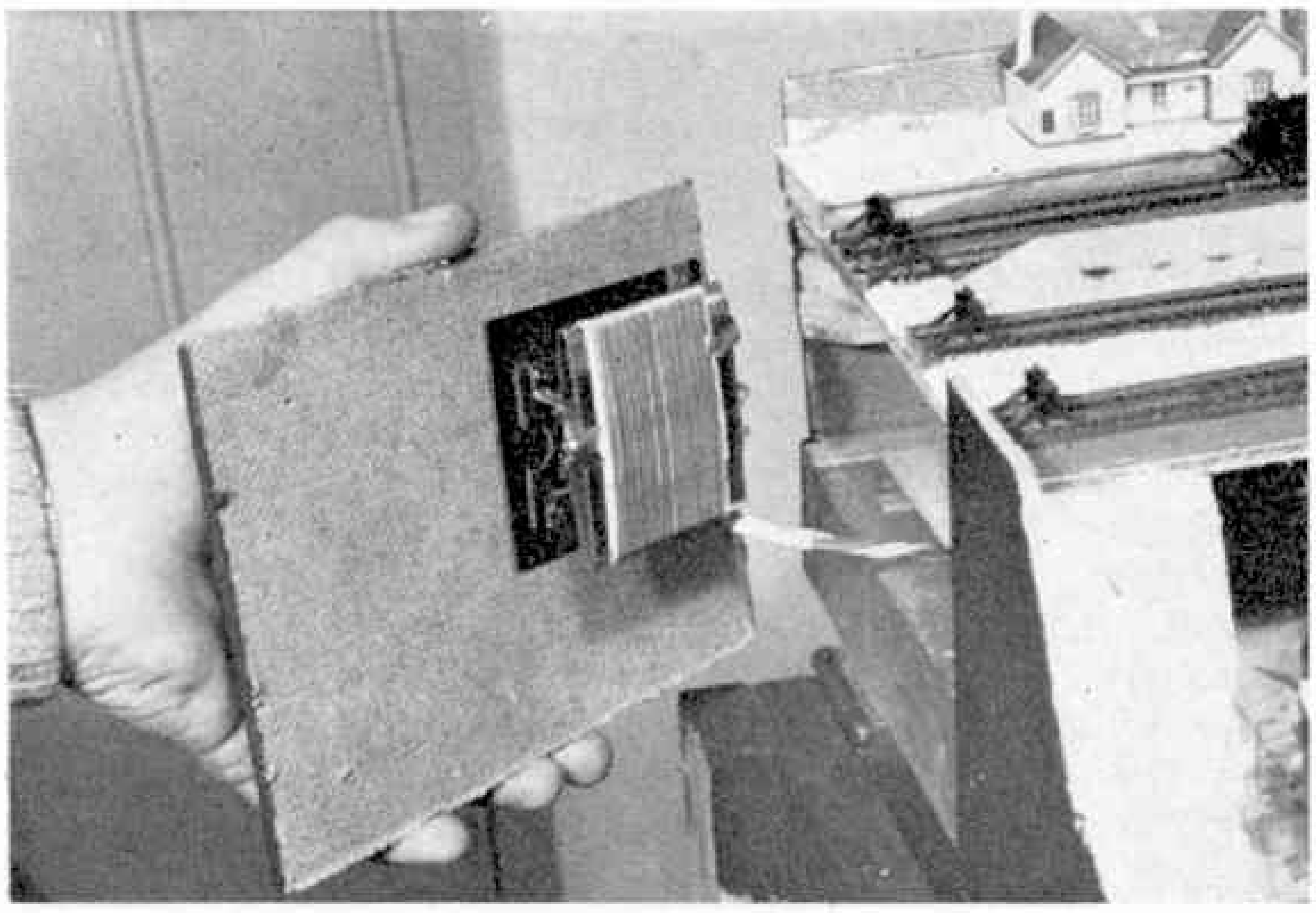


Heading: Bells of various sizes waiting to be transported to America. Left: Inscribing and decorating a bell calls for great skill. Above right: The Liberty Bell as it stands in Independance Hall, Philadelphia. Right: A bell is tuned by removing metal from the inside with a large vertical lathe.

BUILDING AN 'N' GAUGE LAYOUT

by P. Tomlinson

PART VI ELECTRIFICATION



A small controller of this kind can often be mounted into the baseboard structure itself, instead of on the lineside.

WITHOUT ANY doubt, the most important aspect of electrification is the electric motor which drives the locomotive. To make the motor go, and to provide speed and directional control of our trains, we must have an electricity supply.

In order to do useful work, an electric circuit must have a flow-and-return, that is to say, the current-carrying conductors must make a path from the power unit, through the apparatus to be operated and back again to the source. That is why it is called a " circuit "—a complete break anywhere in the circuit causes interruption of the current and the work done instantly ceases. Our electric motor then, has to have connected to it a " feed " and a " return " wire, and when connected to the proper supply, it runs at full speed (Fig. 1). In order to prevent it from running when we do not wish, we install apparatus like for example a switch (Fig. 2). Another essential requirement is that we control the speed. This is usually done—though not always—with a variable resistor which has the affect of reducing or restraining the voltage in the circuit (Fig. 3). Turning the control knob of the resistor varies the amount of the voltage flowing in the circuit and with it the speed of the motor.

The third factor which we need to control is the direction in which our engine runs. This is carried out by merely reversing the direction of the supply—in other words crossing the feed and return wires over. To do this, we use either a special switch, in conjunction with a variable resistor (Fig. 3) or a commercial reversing controller which gives speed and reversing controls in one unit (Fig. 4).

Although it would be possible to design a layout and locomotives to operate straight from the mains, this would be difficult and extremely dangerous. So our models run off a supply at a much lower voltage, generally 12 volts. This can be provided by either dry batteries, for small, simple layouts, or a car battery rated at 12 volts. Both are expensive ways of providing power, especially batteries, because of their short life. A 12 volt car battery is expensive to buy and has the inconvenience of having to be recharged at intervals. By far the best way is a transformer and rectifier working from a.c. mains. Many good units are available, all specially designed for model railways and I shall assume that one of these will be used.

It is possible to use almost any type of wire to connect up the power unit to the track, but the ideal is plastic covered flex. Colour is not important, unless you wish to distinguish between the " Feed " and " Return " wires and the 15 volt a.c. supply to point motors.

You can run the wires directly from the control panel to the track, but I find it better to take it through at least two tag strips or chocolate block terminal strips of the type made by Tri-ang screwed to the baseboard framing—one for the feed wires, and the other for the return. This will simplify the wiring and make it a lot easier to rectify an error, as well as providing an anchorage for inter-baseboard wiring.

The connections to the tag strip and the rail are best made by soldering, using an electric soldering iron of about 15 to 25 watts rating. You will also need a coil of cored solder, a pair of small pliers, a wire cutter and a wire stripper.

Most tags have a small hole in the end, and the bared end of the wire is threaded through this hole and bent back. The hot iron is placed on the tag and the end of the solder is held against the tip of the iron. As soon as the solder melts, remove the iron and allow the joint to cool. Tug the wire to see that it has made a sound joint, and the job is done. Use plenty of heat and unless the solder melts quickly and forms a bright silvery blob, remove the iron. Any other joint will be a bad one and should be re-soldered with a hotter iron. In most cases, a tug on the wire will show this, because a " dry " joint, as it is known, has little strength and the wire will come loose.

When soldering wire to the rail, take care to find a suitable position like across a rail joint—where this is not an insulating gap. Drill a small hole through the baseboard alongside the rail, between two sleepers, push the wire up and remove a quarter of an inch of insulation from the end. Scrape away all the oxide coating from the web of the rail with a small screwdriver and place the bared end of the wire into this place. Apply the heated soldering iron bit, and solder the wire to the rail. If you have to attach wire to screw terminals, like those on a power unit, never strip off more insulation than is necessary and also twist the bared end of the wire into a clockwise loop. Place the loop over the terminal and tighten up the screw, closing the loop in the process.

Development of the simple layout, with one engine, one operator, one power unit and one pair of wires to the track usually begins with additional locomotives. These have to be "parked" when not in use, on sections of track electrically isolated from the rest of the layout. If these sections are well arranged, very realistic operation becomes possible and the layout will be far more interesting.

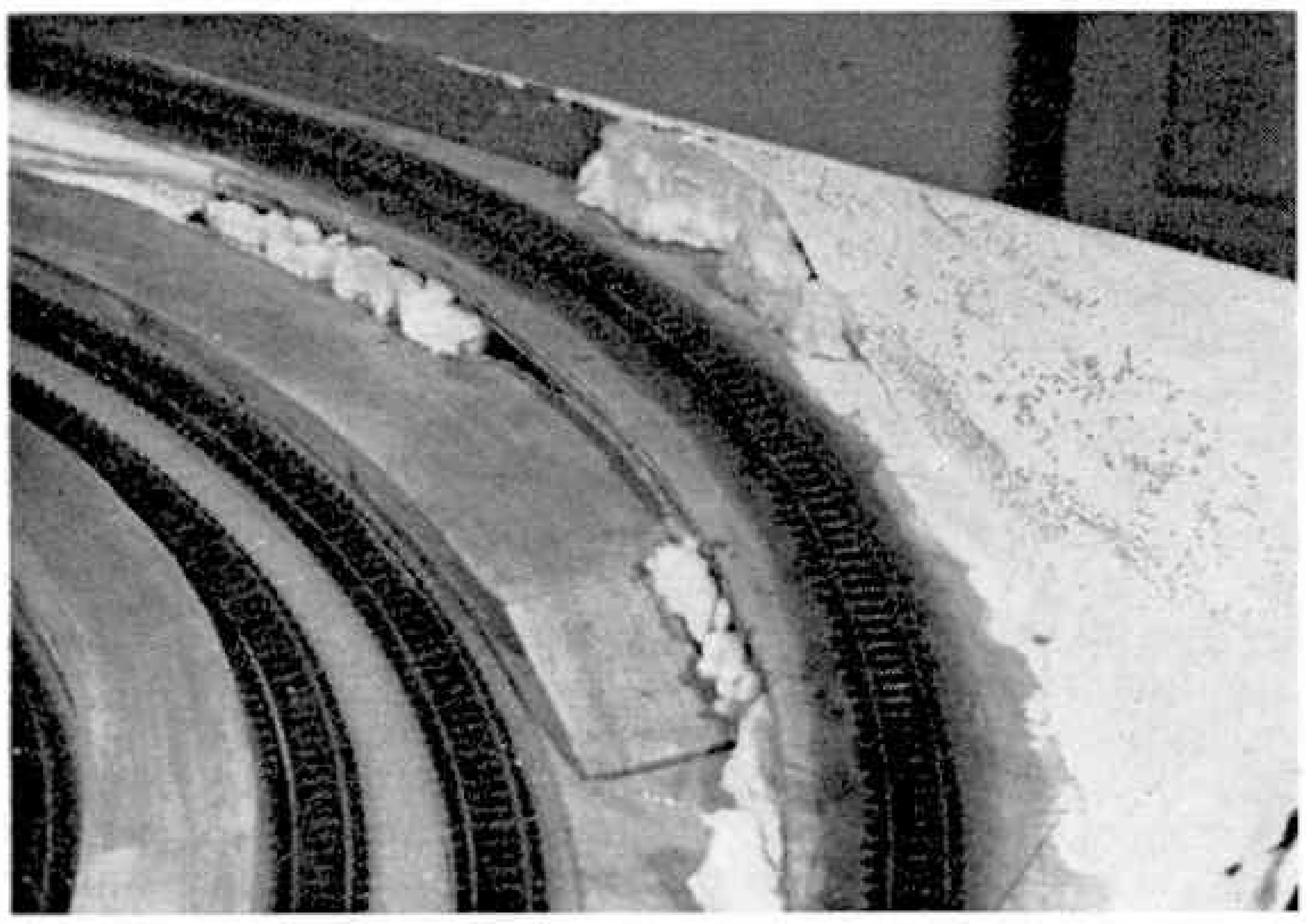
Broadly speaking, it is wise to provide a dead section in every position where a locomotive is likely to remain standing while another is being moved. An obvious place is at the buffer stop end of a station platform, so that when a train has arrived another engine can be backed on to draw off the coaches. It is also useful to be able to hold a train on the running line itself, just clear of the station, while stock in a platform line is being shunted to allow it to enter.

In practice, dead sections are usually left on or "live", and are switched out only to "kill" a locomotive so that no matter how many are included, it does not make a layout any more difficult to operate. Fortunately, the majority of commercial "N" gauge points are isolating points and have an isolating switch incorporated in their design, allowing the electric current to flow only in the direction the point is set for. This eliminates the need for a separate switch on the control panel for each siding and switches only need be provided for main line sections and dead ends.

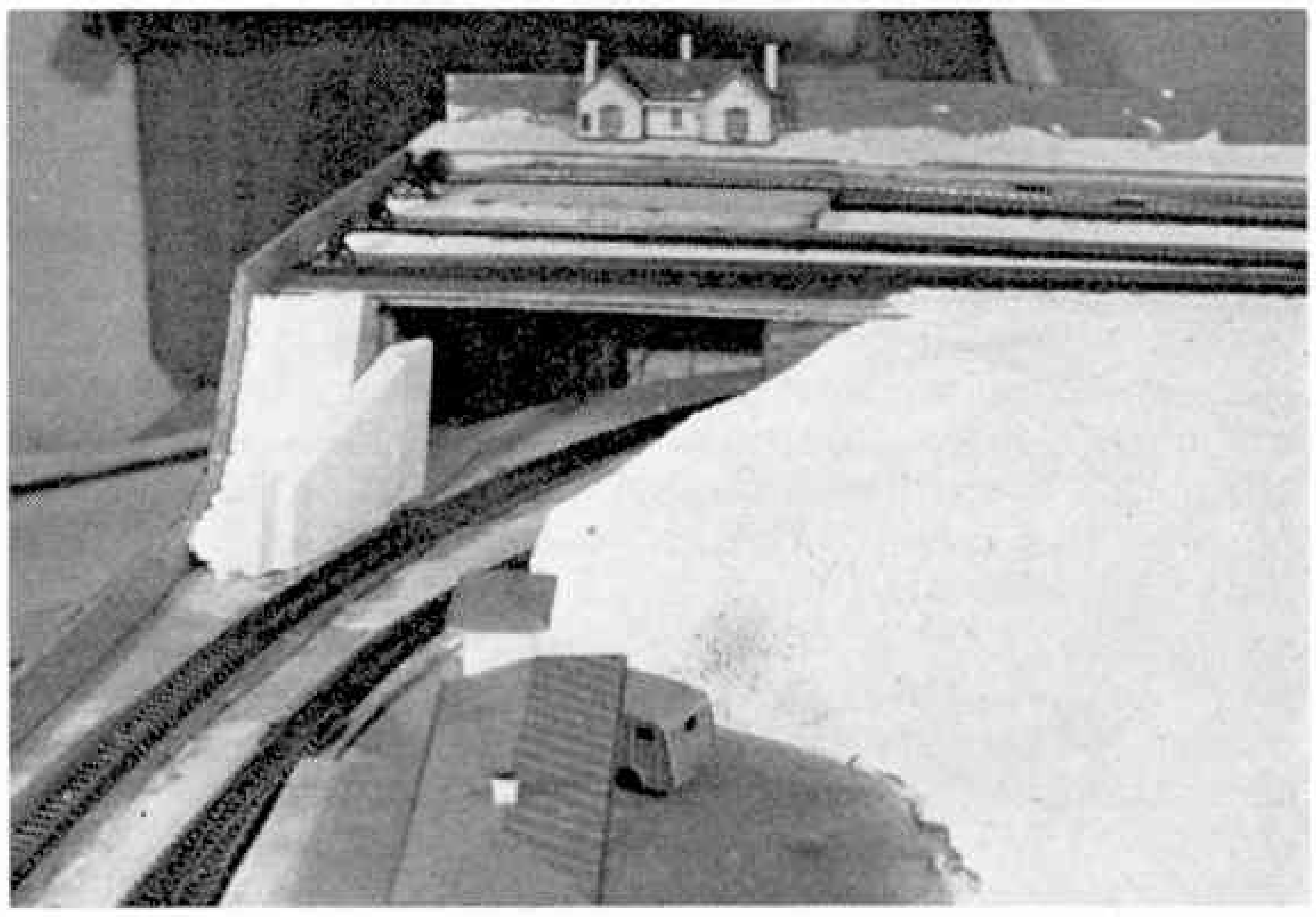
Small on/off toggle switches are all that are required, and these should be mounted on a suitable wooden board, preferably alongside the control unit. This board can be fixed to a light frame for screwing or bolting in a convenient position on the side of the baseboard. If a tag strip is also mounted on this control panel, the feed wire from the controller should be soldered down one side, with other wires from the other side going directly to their appropriate switch. It simplifies matters if the switches and their tags are numbered. From the other terminal of the switch, the wire is taken to a further tag strip under the baseboard, and then to its appropriate track section. The return wire from the section goes direct to the return on the controller, via another tag strip. Fig. 5 shows a simple wiring circuit.

Two further points should be noted. The first is that isolating gaps, joined by nylon fiishplates, MUST be provided in each rail between sections, and secondly, the feed and return wires must be soldered to their respective rails, otherwise the locomotive will operate in opposite directions on adjacent sections!

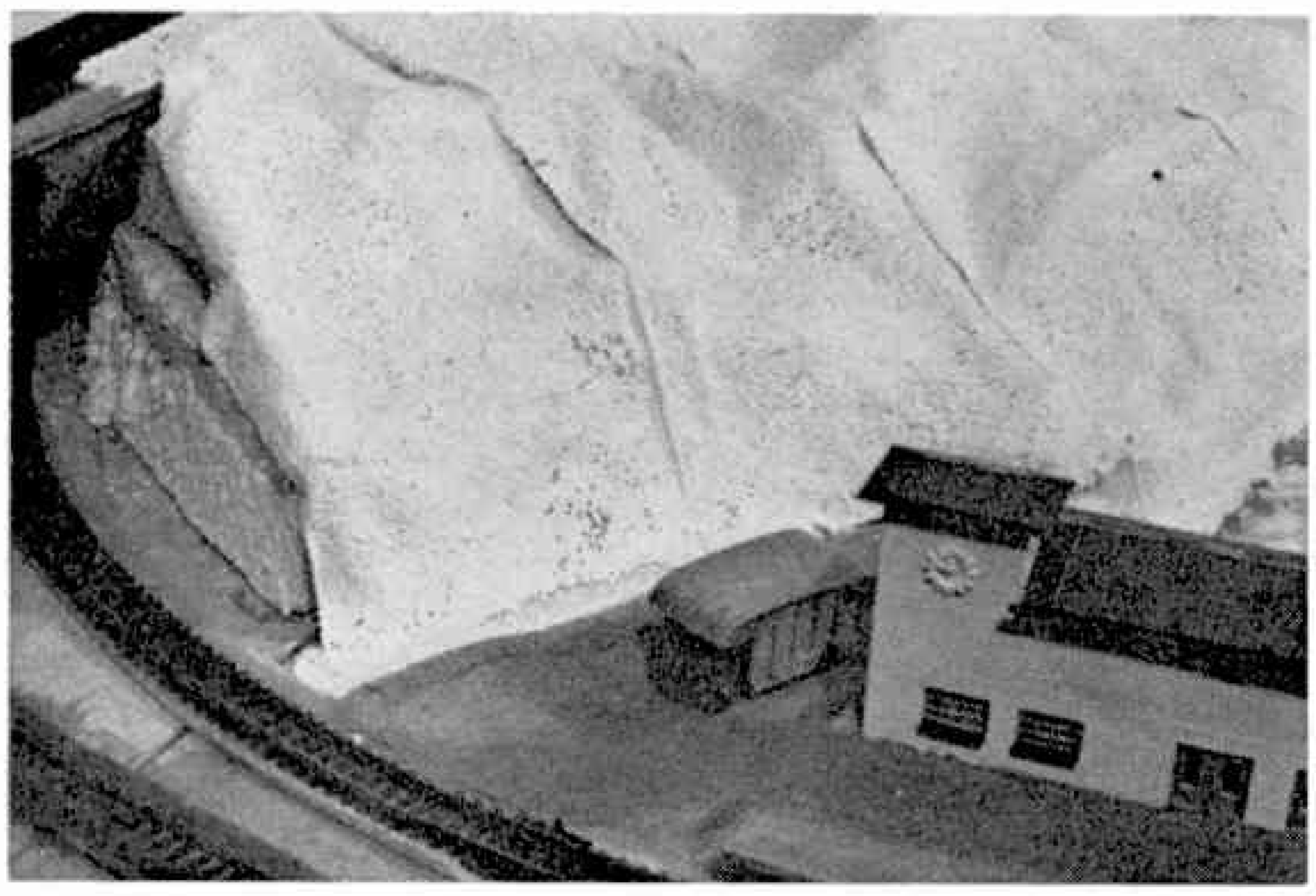
SCENERY WITH "MOD-ROC" . . . . More next month



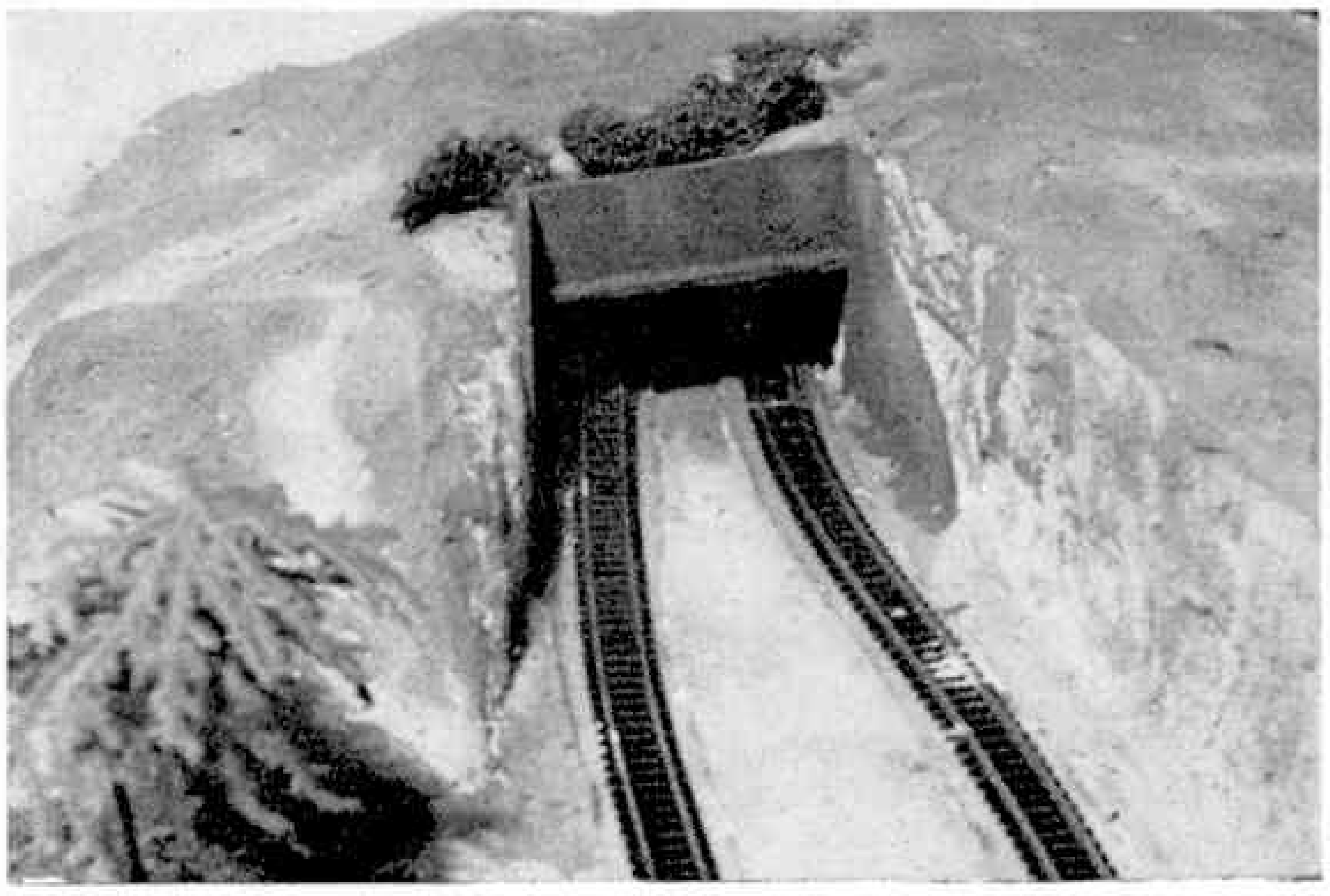
The Mod-Roc scenic material needs support, which can be provided simply with screwed-up newspaper, seen behind the platform in this picture.



Having immersed the Mod-Roc cloth in water for three or four seconds, and gently squeezed it out, it can be applied and gently pressed to shape, giving a result as above.



Mod-Roc "hillside" before painting. The texture of the material can be seen clearly in the photograph. Note the supporting softboard "Former" on the left.



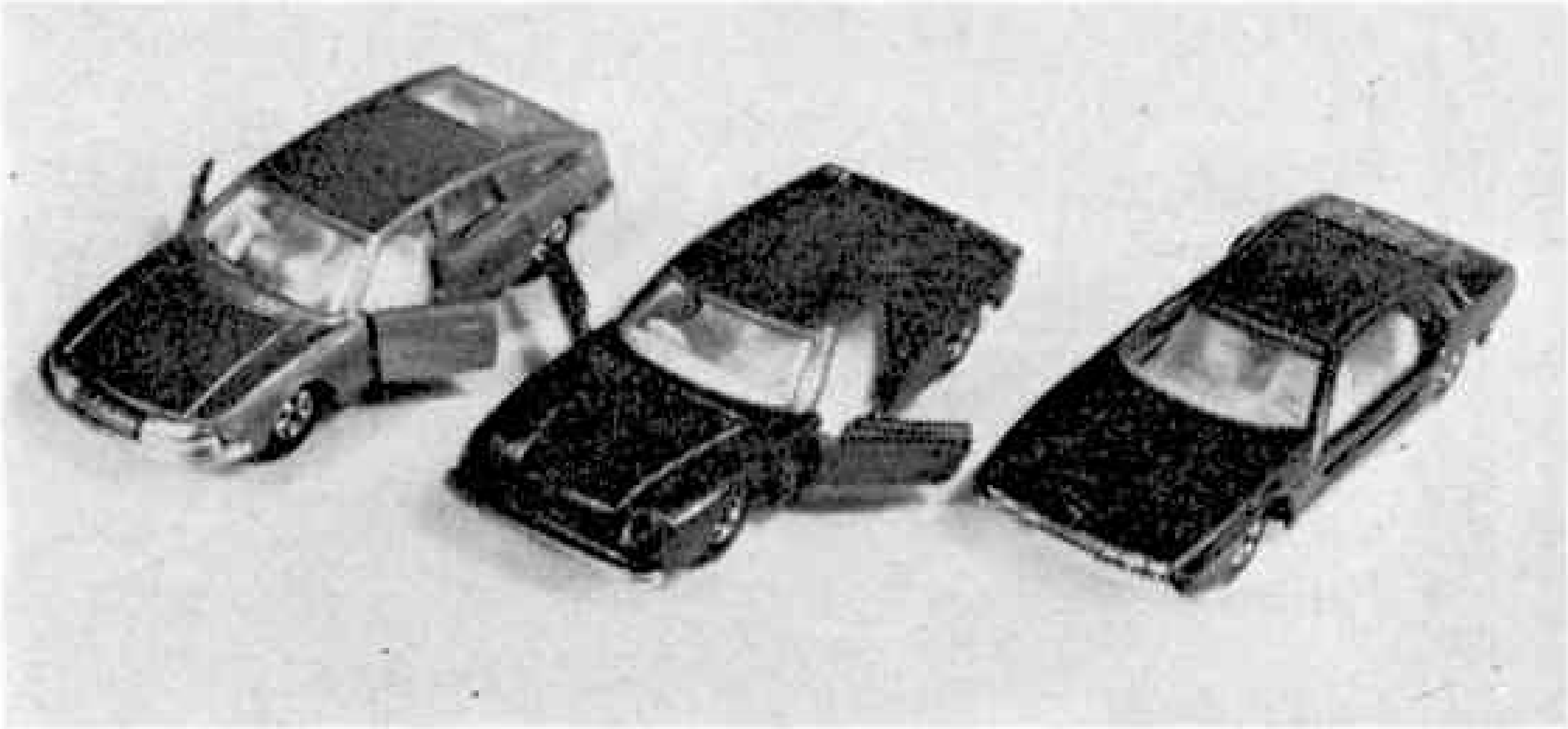
Tunnel approach cutting after painting. Bare patches of Mod-Roc simulate a chalky terrain, and "trees" relieve any tendency to bareness.

HAVE YOU SEEN ?

Matchbox Superfast Cars

Three really fine die-cast model cars have just been realeased from " MATCHBOX ". They are the Lotus Europa, Lamborghini Marzal, and B.M.C. 1800 Pininfarina.

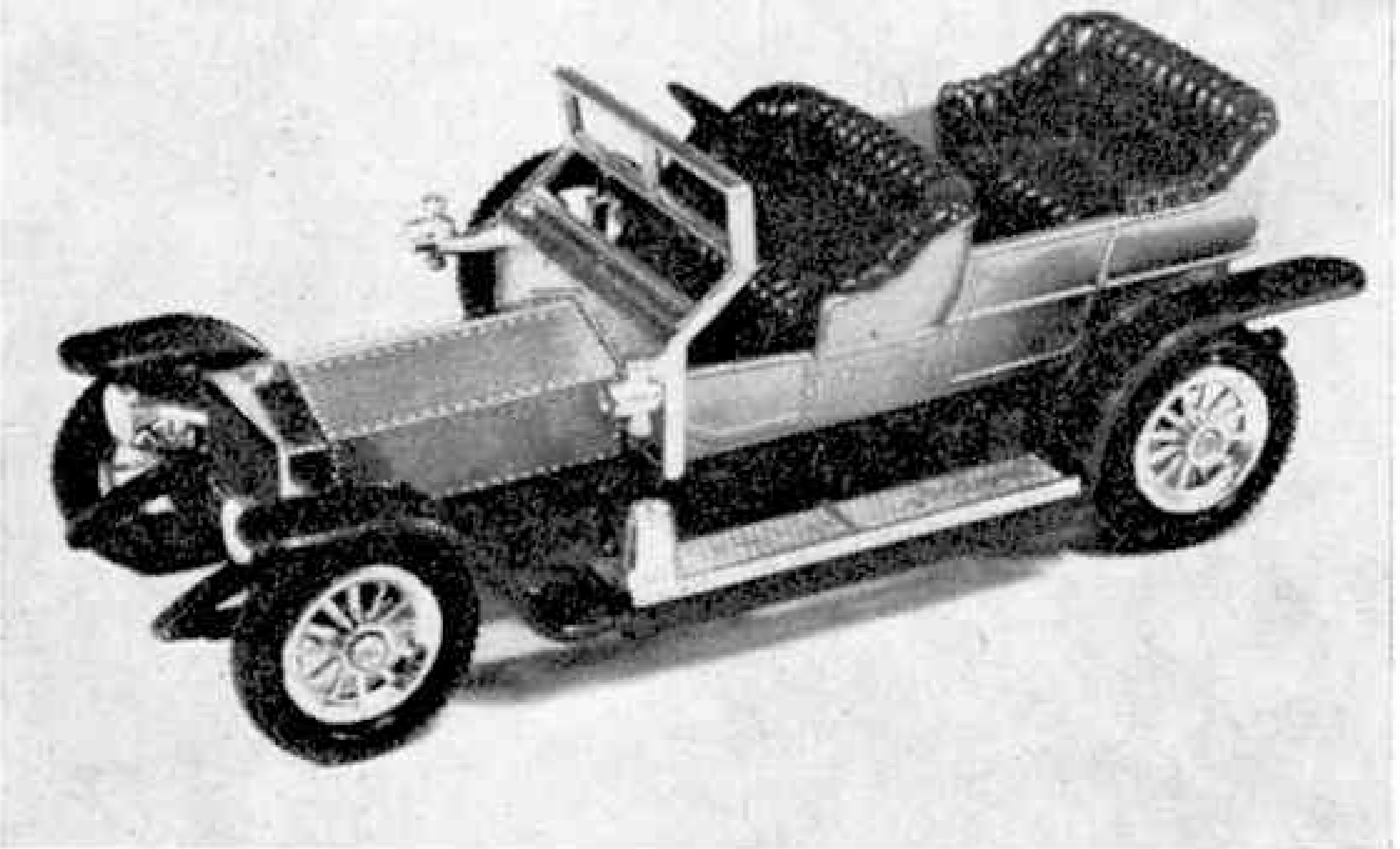
Definitely the best looking of the trio is the Lamborghini. This sleek, little car is finished in Maroon with a well detailed yellow interior. It follows the lines of the actual car very well indeed, including the distinctive windows, which incidentally are tinted yellow. At the front of the car are headlight representations and bumpers all in shiny silver. On both front wings there is a small grill which looks very realistic. The wheels are imitation mags, and the suspension on these is very good indeed. At the back are more silver lights, bumpers, and silver twin exhaust pipes.



The Pininfarina is a little more detailed. With this model, the front doors can be opened and on the inside of these are found door handles and window winders. At the front is a thin silver bumper and silver headlamp covers. The front windscreen has moulded windscreen wipers and rear view mirror. The wheels are the same imitation mag. wheels as on the Marzal, and again the suspension is very good. The model is well finished in gold, and has a white interior.

The last of the three is the Lotus Europa. This, we think, is not quite as good looking as the previous two, probably because of the colour scheme, which is metallic blue body and white interior. We would like to have seen either a red or black interior to give it a more " classy " appearance. Another small criticism is that the two opening doors do not quite fit into the given space. But apart from these minor defects, the car is still a good model, with moulded windscreen and rear-view mirror, inset headlamps, mag. wheels with again excellent suspension, and an added feature—a tow hook.

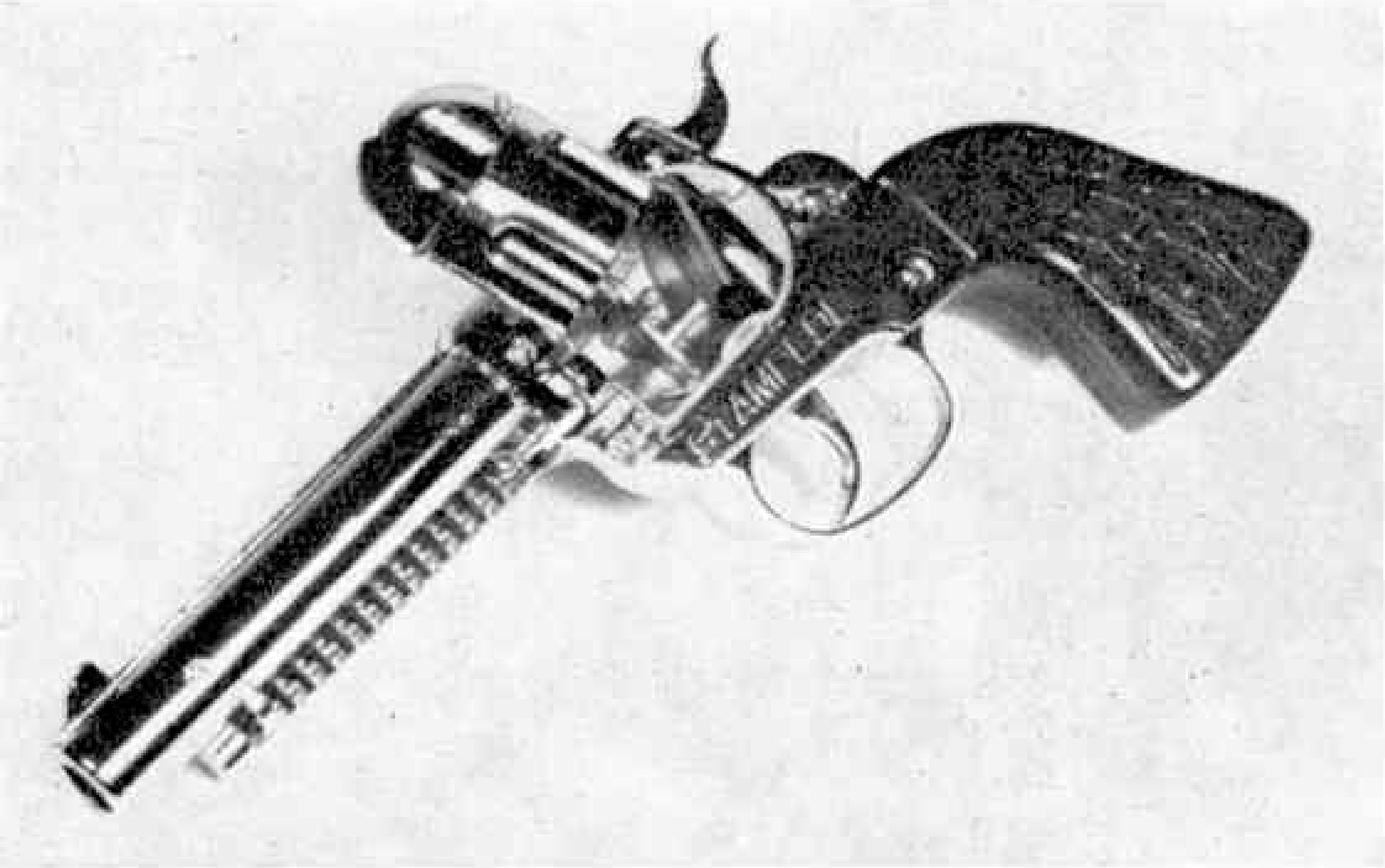
On the whole all three cars are good little models. The caption on their boxes says they're " Superfast ", and that is just what they are. We tested these models, and were amazed at their speed and the distance they travelled after only a slight push. We are sure you will find these speedy models worthy competitors for your " Superfast Motorway Set ", or just as individual toys, and at only 2/4d. per model, they are really good value for money.



Rolls-Royce Silver Ghost

One of the latest releases in the " Matchbox " ' Models of Yesteryear ' series, is this handsome Rolls-Royce Silver Ghost. The detail on this model is very good. Both front and rear leaf suspension units are shown, but, unfortunately only on one side. The simulated leather seats, moulded in plastic and finished in maroon, look very comfortable indeed. The wheels are spoked, as was the case with all cars from the early 1900's, and the tyres are rubber. A spare tyre is stored by the hand-brake on the driver's side. Other features include sidelights and headlamps, acetylene containers, simulated rivets on the bonnet, radiator grill with the familiar double R insignia, door representations, and of course, a steering wheel.

The model is finished in gold with maroon seats and radiator grill. The wings, chassis and suspension units are brown. The model is very robust and will take any amount of rough treatment that a child can give it, yet it is still good enough to be on the window sill or bed-side-table.



Lone Star Stampede Cap Pistol

Something that to our knowledge has never been reviewed in " Have You Seen ? " before, is a cap pistol, but as we received one from Lone Star Products the other day, we decided to include it, as it might be of interest to our younger readers.

Called the Stampede, it is a model of a cowboy's six-shooter with a dummy chamber. The left-hand side of the chamber is a sliding cover that flips up to give access to the loading mechanism, which holds a roll of 100 caps. It is as usual made of die-cast metal, with a plastic butt. There is two choices of finish available, either silver gleam or gunmetal. The gunmetal costs 4/6d., and the silver gleam is 6d. more.

Measuring 8 in. in length, the pistol is very robust, and so we are sure it will give many months of enjoyment to the owner.

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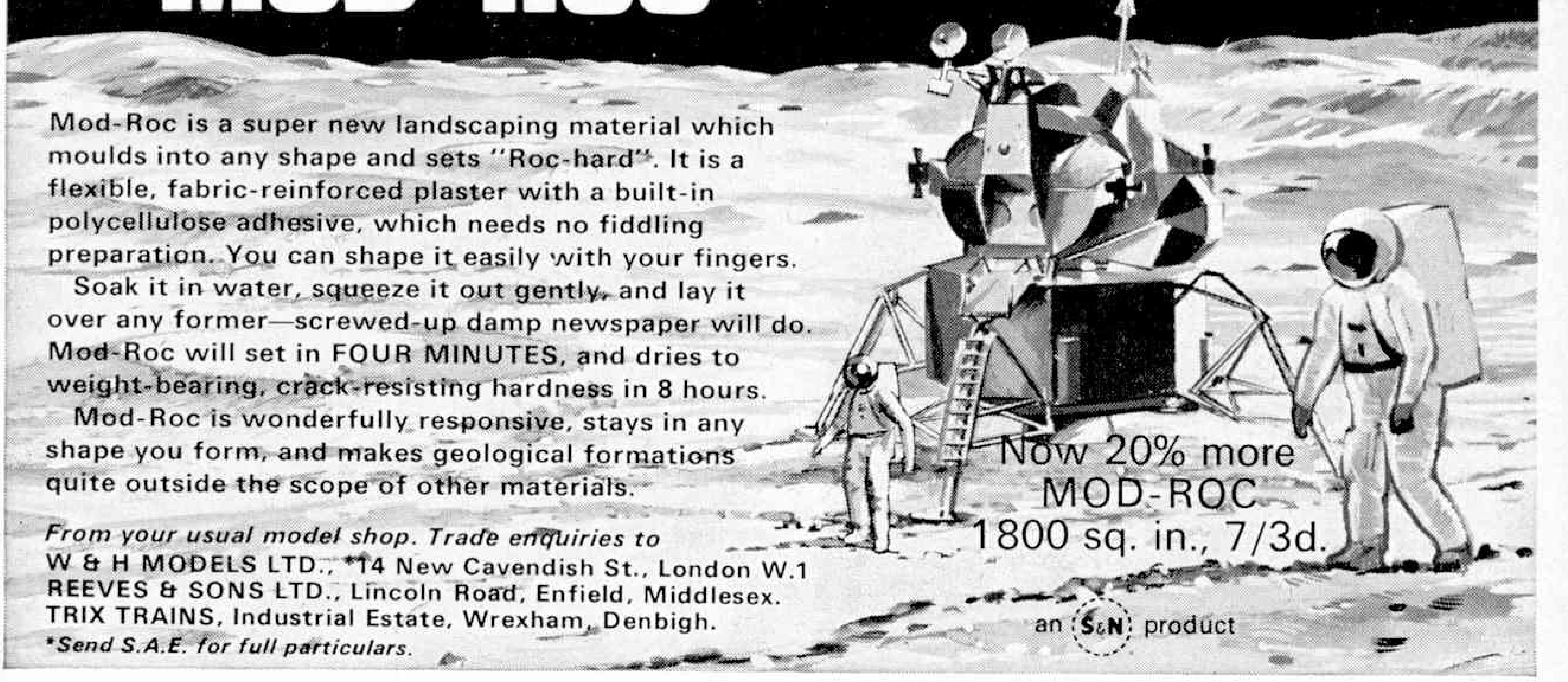

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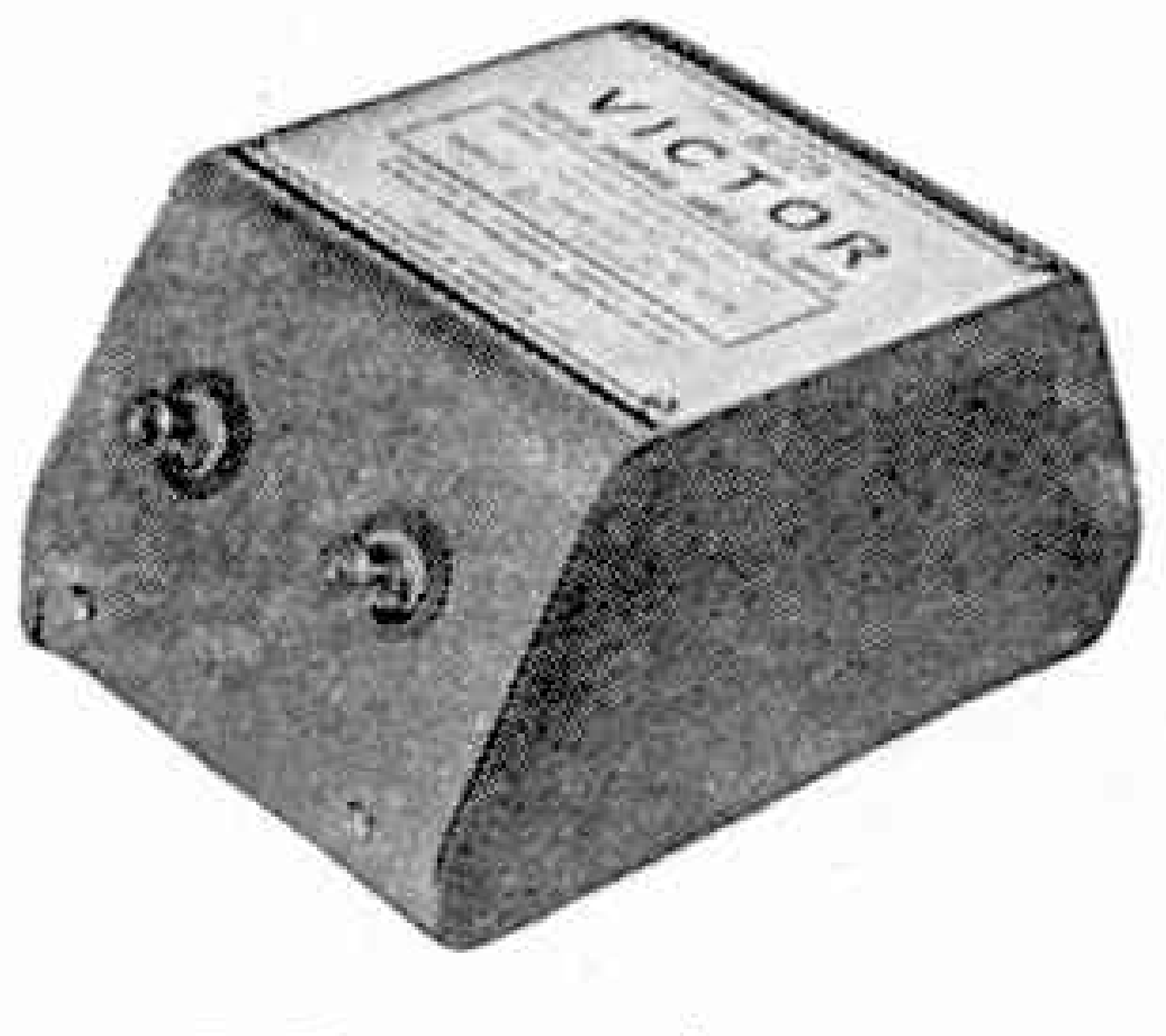

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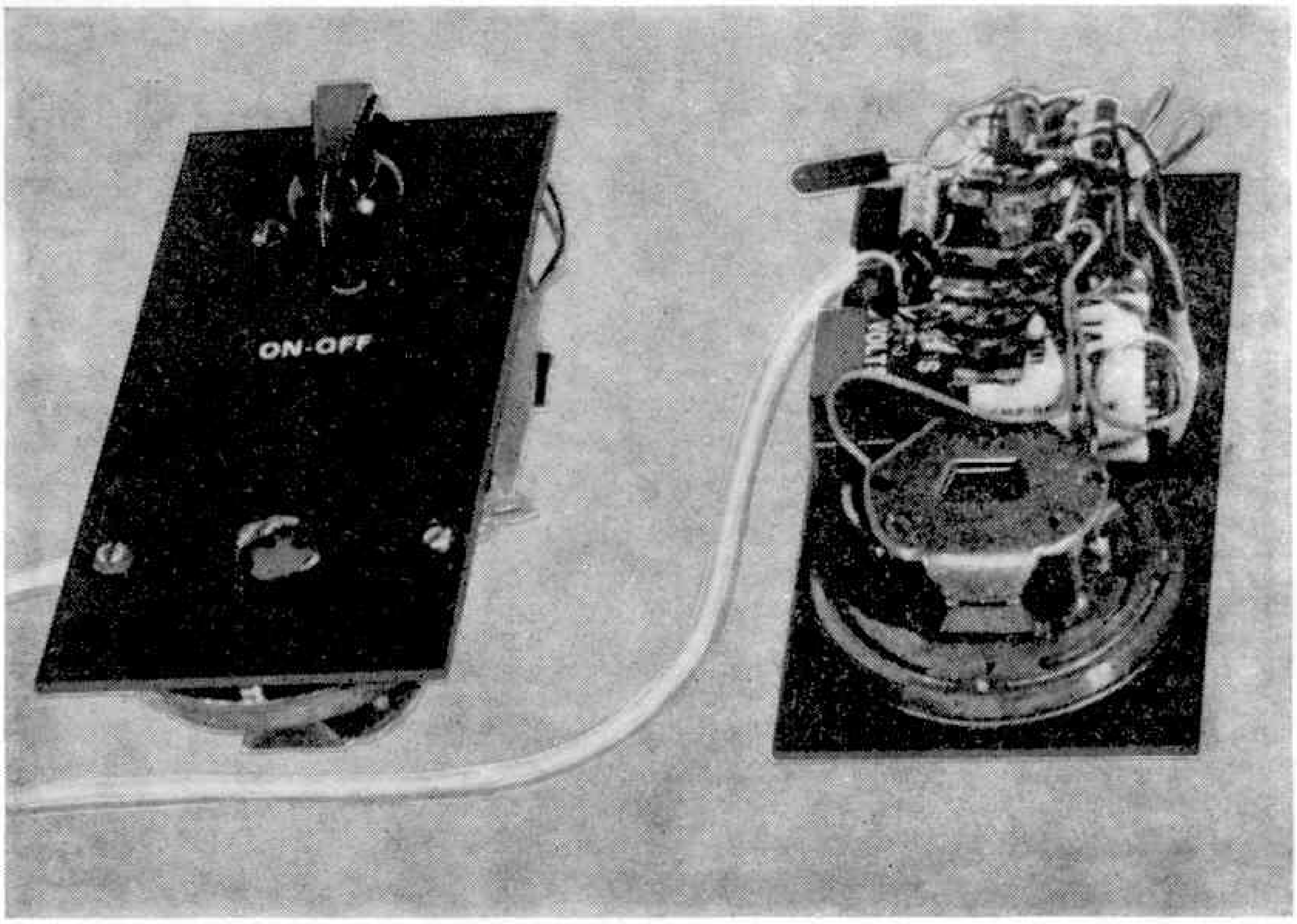

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POW! New power driven Dinky Toys

sam's car FROM JOE 90

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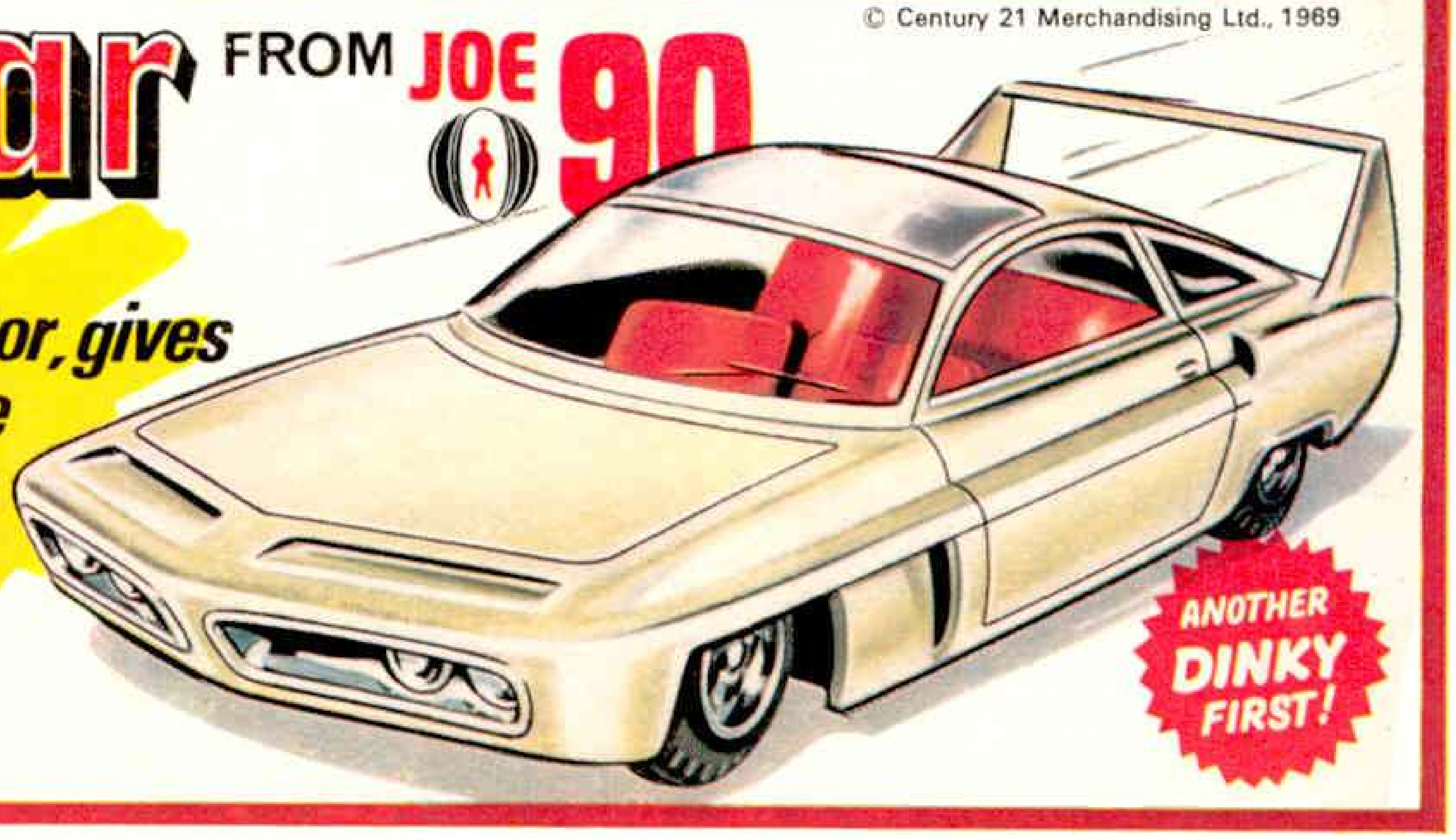
with the fantastic KEYLESS clock-work motor, gives powerful automatic drive

World Intelligence Network Lapel badge included.

Another super Dinky with all the authentic details, and an airfoil stabiliser for extra road holding.

Model No. 108


ANOTHER DINKY FIRST!

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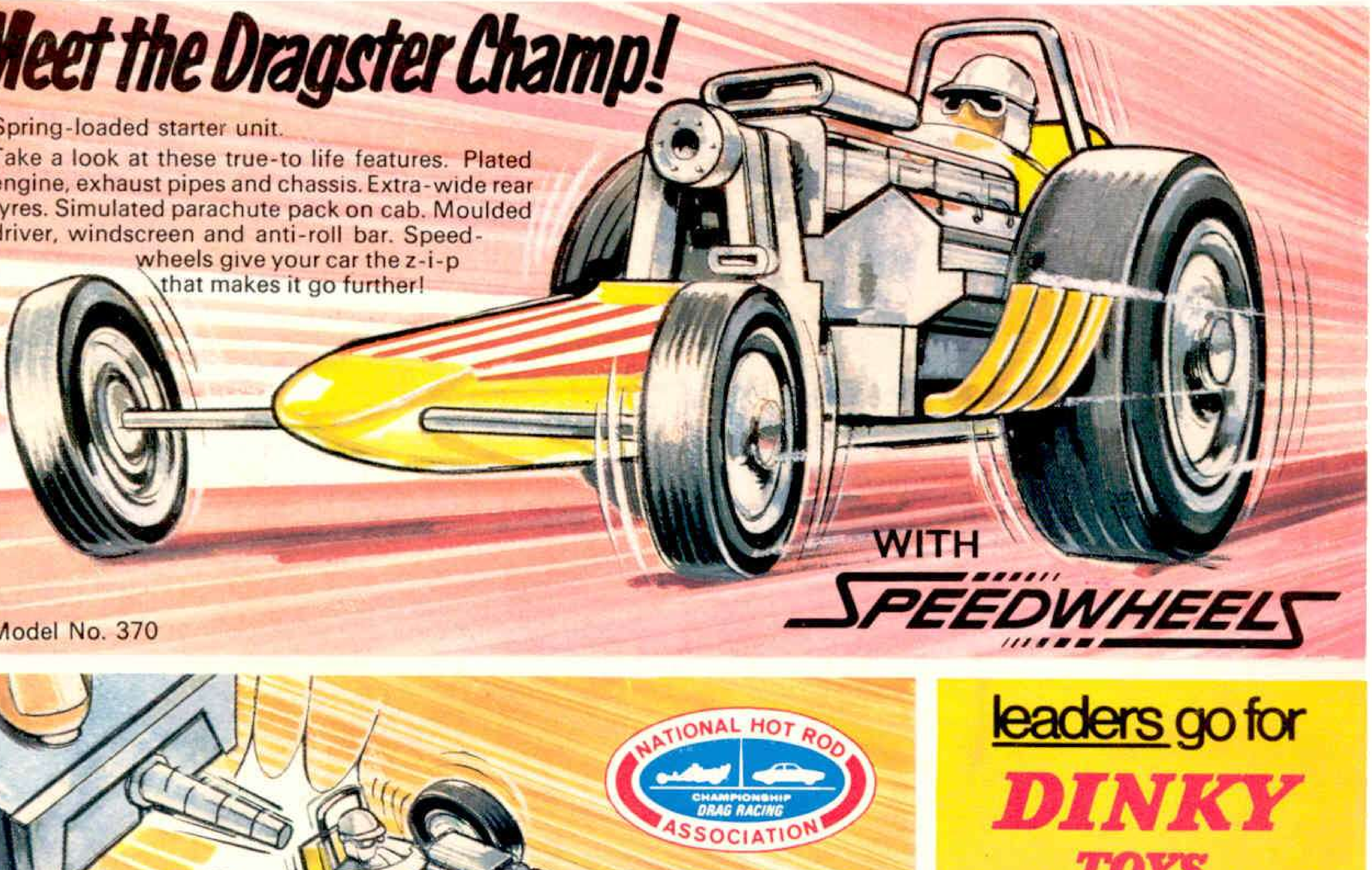
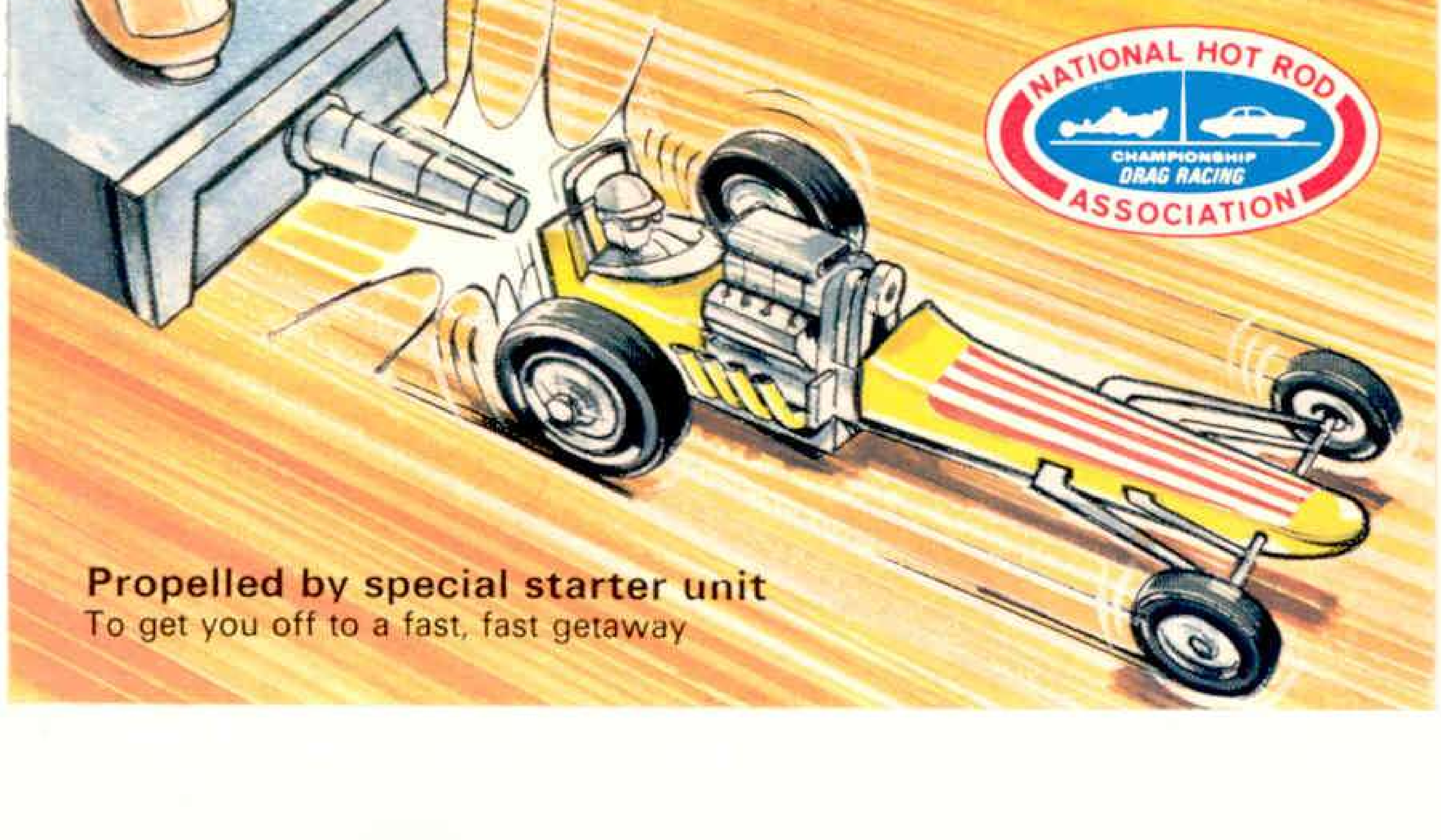
Spring-loaded starter unit.

Take a look at these true-to life features. Plated engine, exhaust pipes and chassis. Extra-wide rear tyres. Simulated parachute pack on cab. Moulded driver, windscreen and anti-roll bar. Speed-wheels give your car the z-i-p that makes it go further!



WITH SPEEDWHEELS

Model No. 370



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Propelled by special starter unit
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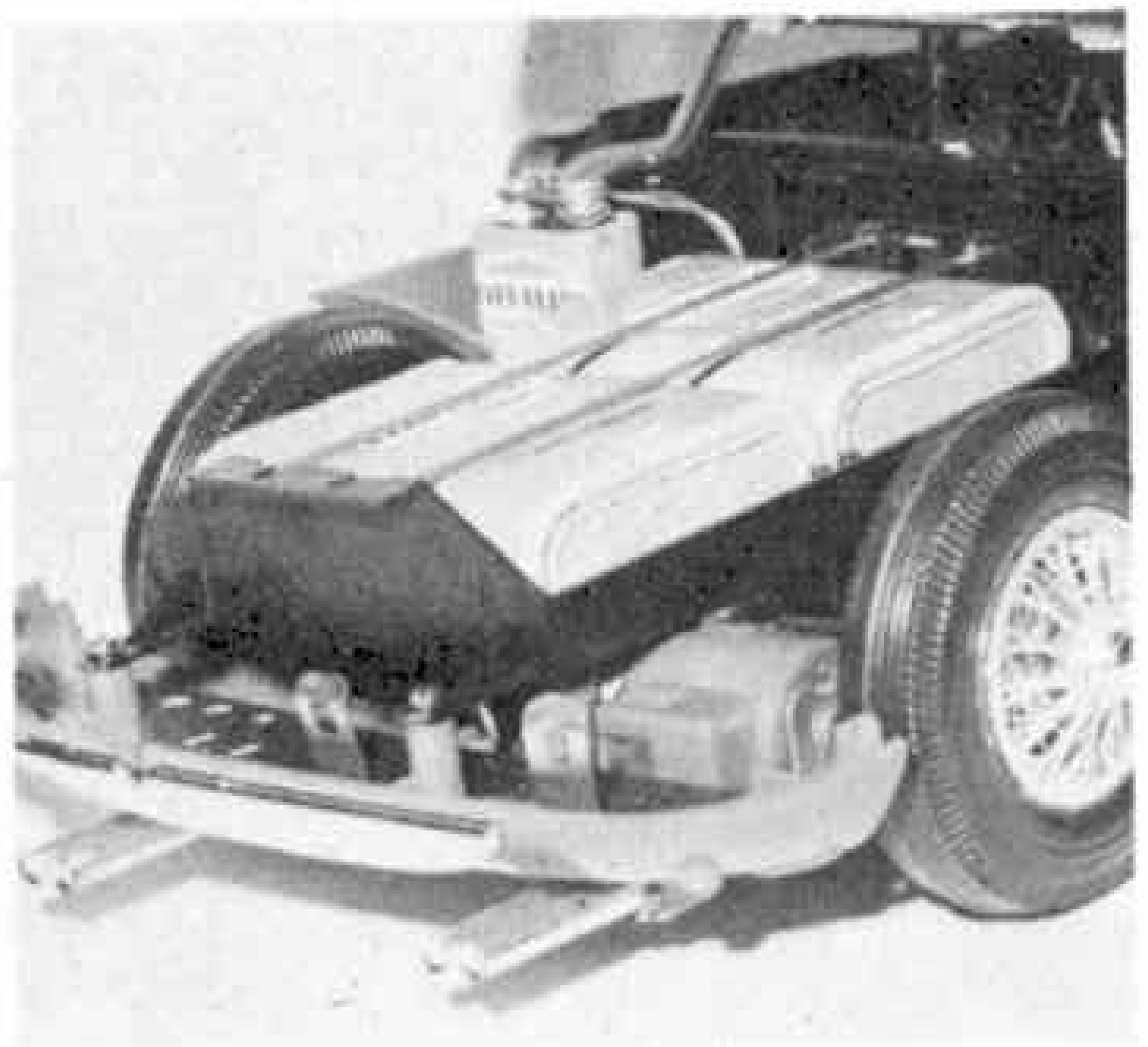
leaders go for
DINKY TOYS

the tough, all-action models



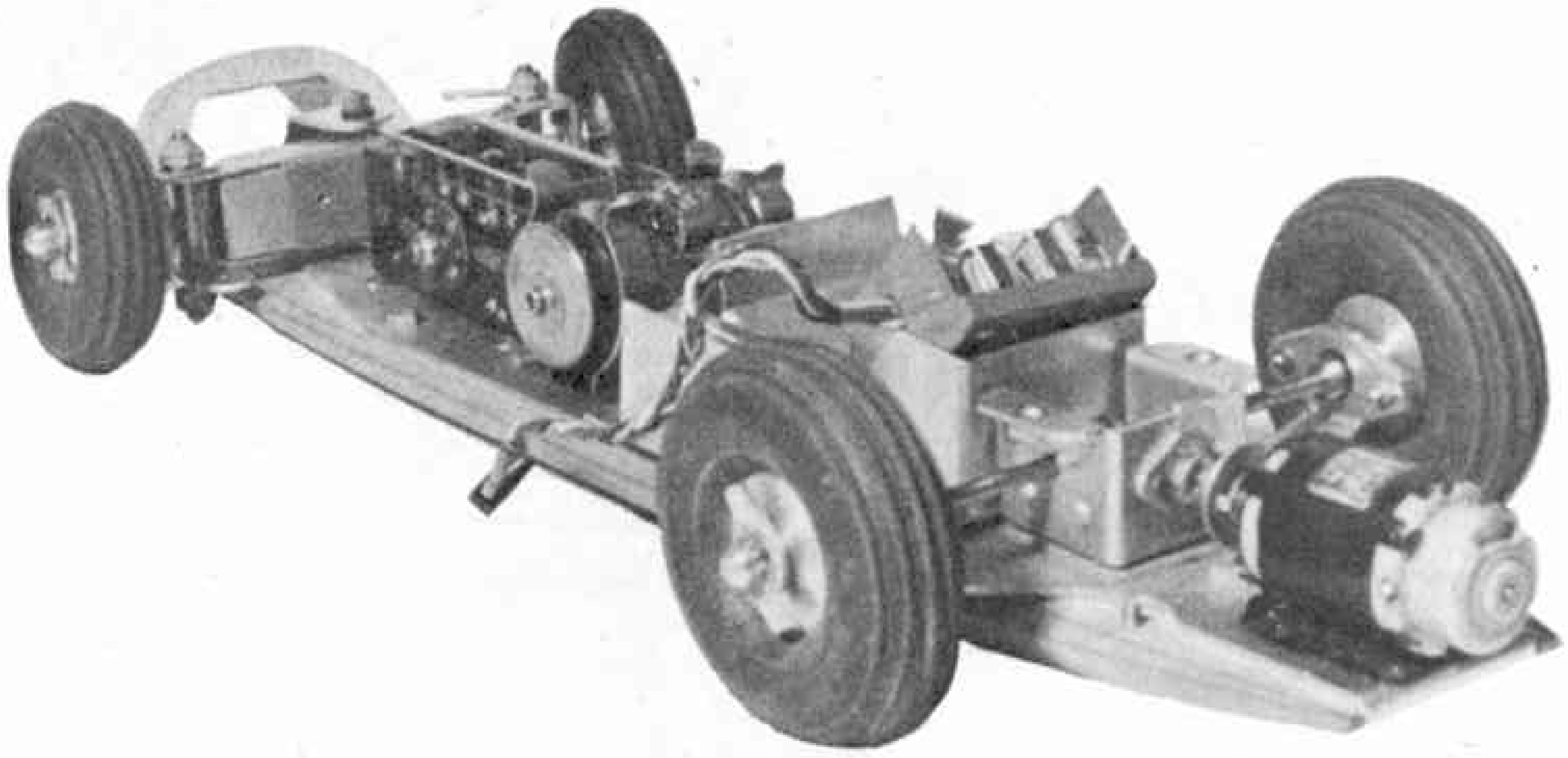
Shows location of good stout batteries over rear axle of a car. Note electric motor front right – driving road wheels by spur gears. Battery in background standing up is for receiver.

SUMMING UP

This booklet rambles over quite a lot of ground, suggesting various ways in which R/C model cars can be tackled. It is not intended to do more at this stage than set you thinking, doodling perhaps, on scraps of paper and working out a dream car. In our next month's instalment we shall go into precise detail for building 'Ca' Canny', a freelance racing car. We shall also show how to motorise and fit simple R/C gear into two readily available plastic kit models for the benefit of those who do not want to make it all.

The Ferrari model illustrated and on sale complete with receiver and transmitter from Beatties of London and other firms – mainly as an introductory toy! – will also be available as a construction kit, using the scale body, and with a fully steerable Akerman unit, electric motor, etc. Some of these cars will be demonstrated at our Model Engineer Exhibition in January . . . and certainly take the problems out of building!

Finally, we would again remind readers that to operate radio control equipment, they must obtain a Model Control Licence . . . this costs 30/- for five years and is available from G.P.O. Radio & Broadcasting Dept., Waterloo Bridge House, Waterloo Road, London, S.E.1. *There is NO examination – just a simple bit of form filling!*



Shows what goes under the balsa body on Mr. Hadley's racing car. Note quite powerful electric motor here – and the smart gearbox with crown wheel and pinion installed.

SUPPLEMENT WITH MECCANO MAGAZINE,
DECEMBER 1969

RADIO 4-2

INTRODUCTION TO SIMPLE CONTROL OF MODEL CARS

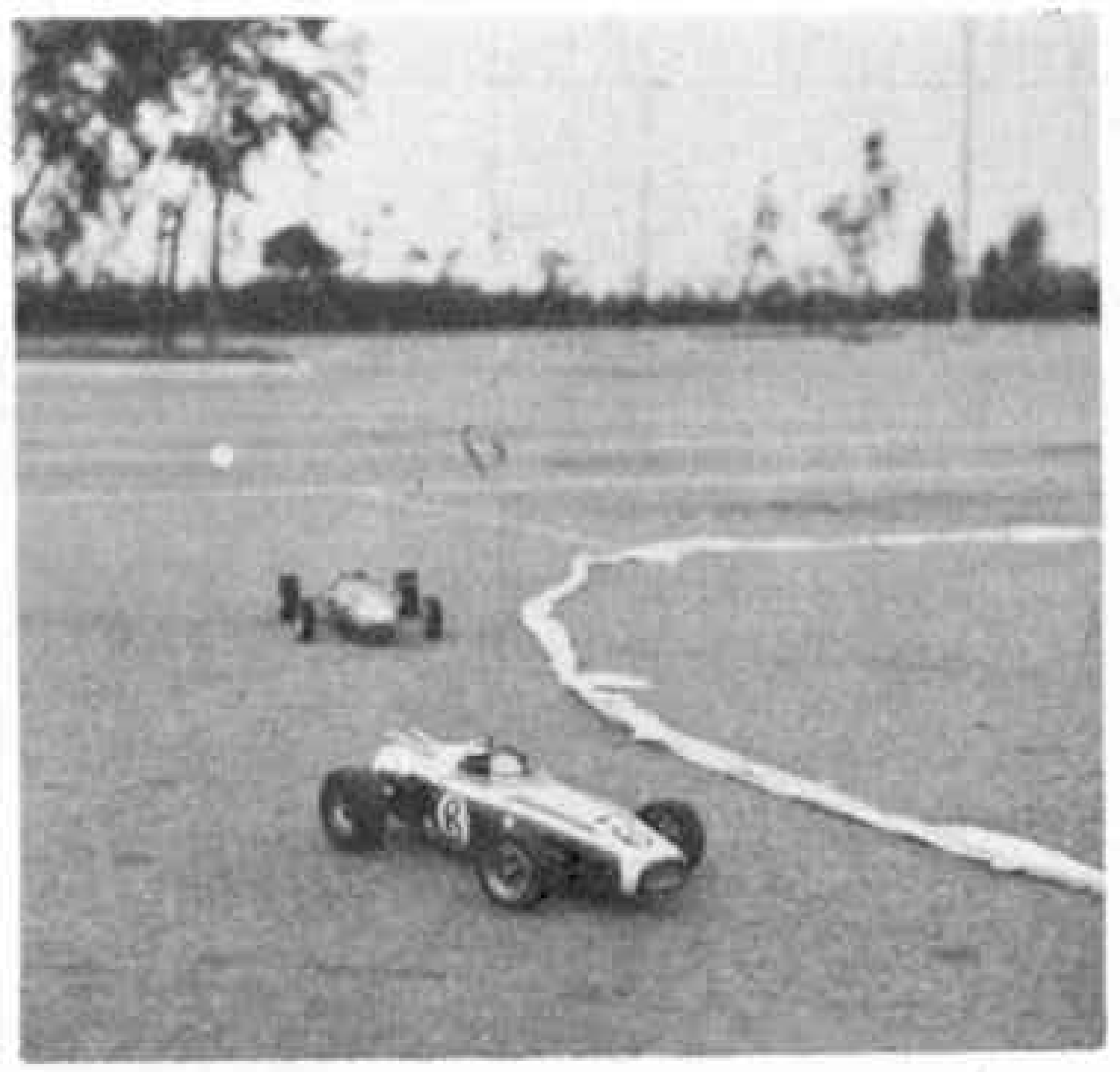
INTRODUCTION

The Cinderella of Radio Control is undoubtedly the land vehicle which includes cars, lorries, chara-bancs and half-track vehicles such as tanks and Bren-gun carriers. It is difficult to know why this should be so, since there are probably more suitable places for operating a model on land than there are flying fields or lakes for aircraft or boats.

To consider first of all where one should operate a model car we can list at once any reasonably smooth school playground, a hard tennis court, a parking area which is reasonably smooth in a non-busy time, any cul-de-sac, a concrete driveway to the garage at home, the floor of the garage itself, and a hall large enough for badminton. In fact, the number of places are so numerous that it is just incomprehensible why nobody seems ever to be using them for this purpose.

WHAT SIZE TO BUILD

What size to build a model car or other land vehicle is determined by two things; the availability of parts which can be obtained ready-made and the skill of the builder in producing miniaturised electronic items to go into the model size chosen. To start with, the most difficult size we would consider is 1/32nd scale. It is a great pity that it is difficult to put radio control in so small a model, because there is a greater variety of mechanical parts in this scale ready for use at moderate prices than in any other. It has the added advantage that in this small size the model will not be much more at the most than seven or eight inches long and be operated in any convenient corridor or linoleum covered room, and still have ade-



Typical cars racing on a smooth surface in the open air. In this case heavy tapes have been laid to outline course – alternatives could be hosepipe, rope or even garden edging.

quate room to manoeuvre. Some quite interesting and highly successful models have been radio-controlled using 1/32nd scale Airfix kits, saloon type, but we do not recommend it to the newcomer, since it demands a high degree of skill in miniaturising the parts. The amount saved in using a small and reasonably priced kit will be absorbed by the high price of miniature components, if they are bought ready-made; and we doubt the available skill if they are not bought ready-made. Anyone successfully attempting this sort of model will not need our help or comment on the electronic side, he'll know it already!

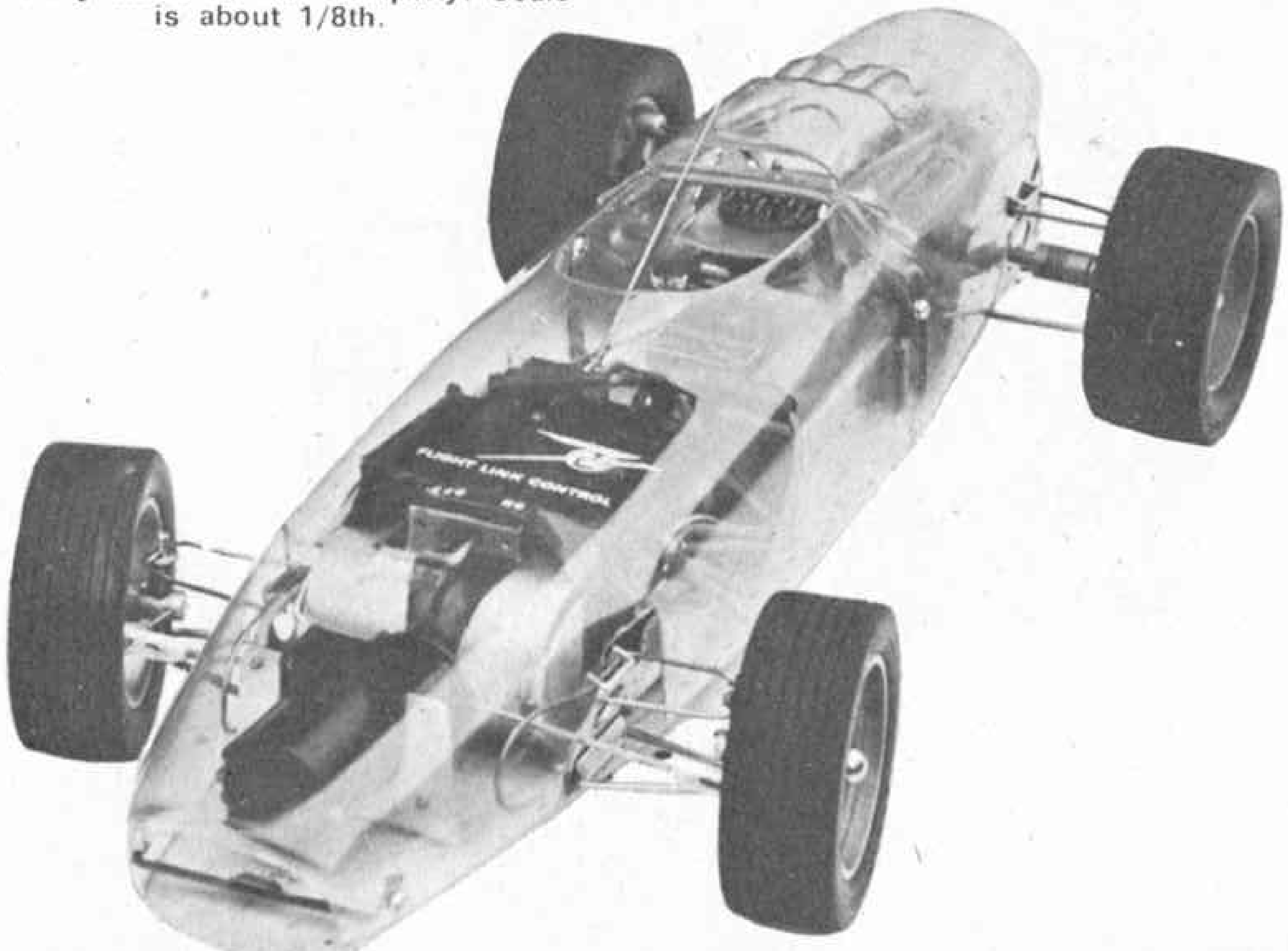
The next size up is 1/24th scale, that is half-an-inch to the foot, and with growing interest in this size for model racing there is a good stock of parts, wheels and so on, as well as kits available. We have now a size which is almost practical to use for comparatively unskilled radio controlled work. It does not leave the whole field of cars available, some in 1/24th scale are still distressingly small, but if we consider larger saloon cars then it is quite possible to get the necessary works in. We should add a cautionary note here that, although it is possible to get the parts in, we shall be running our car on batteries for driving power. There will not be room for a large battery which would be the most economical in operation; we must use small batteries which will need more frequent replacement so that the running cost of the model will still be higher than we would really like.

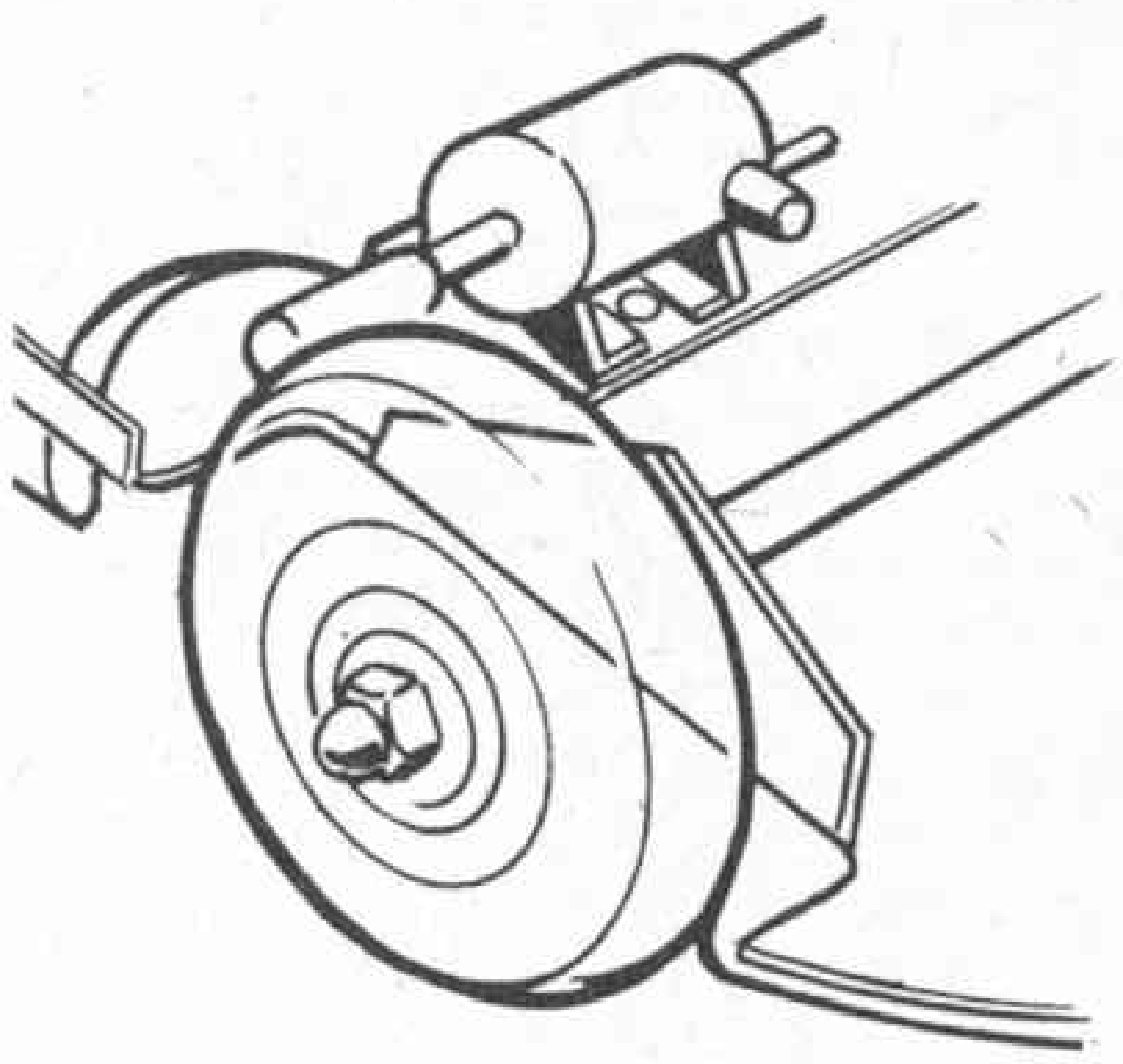
Still going on in size we come to 1/16th scale and we have what could be a very nice compromise size, neither too big to be operated except in a large area, nor too small to be manageable from the skill point of view. Unfortunately in this scale there is only

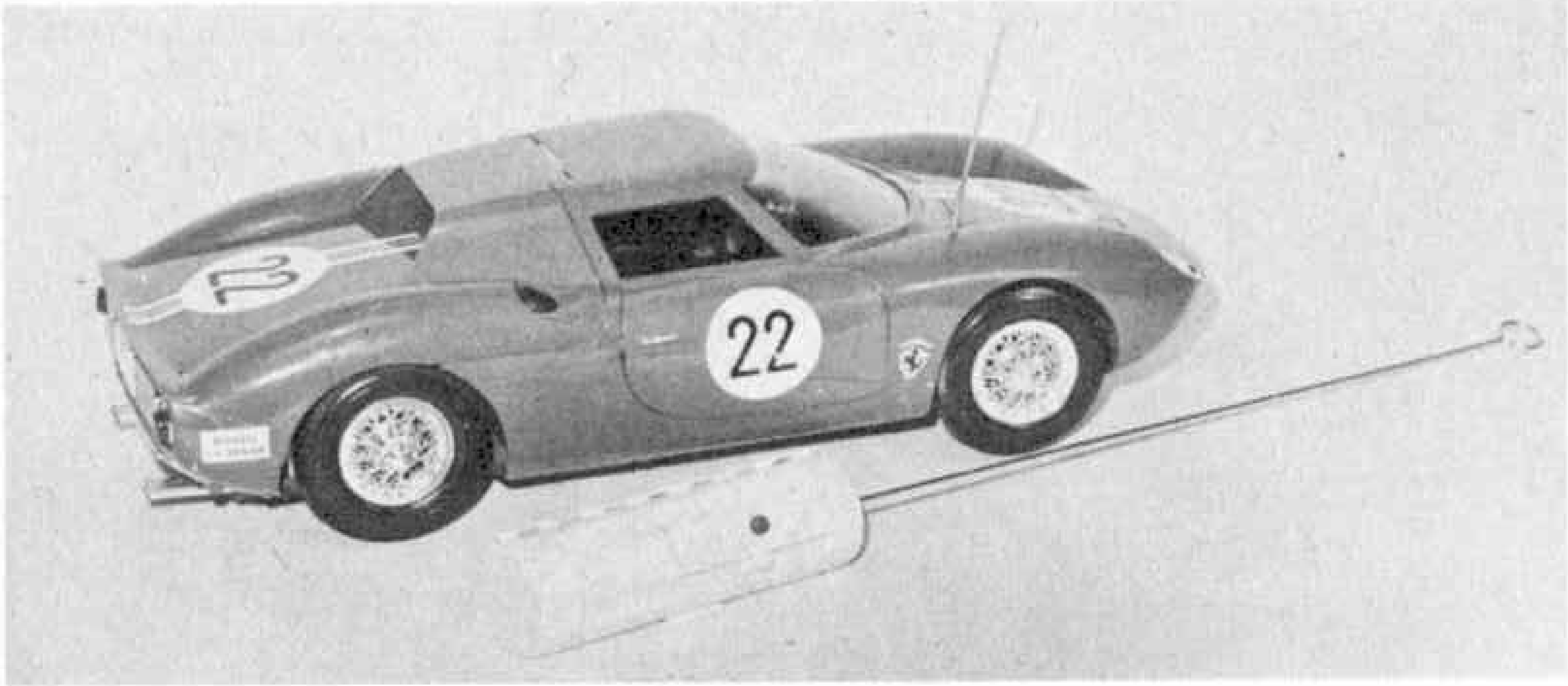
Ferrari model in plastic by Mainstream in kit form, with steering, motor, body, battery box, sells at £4-19-6.

gines like this in an aircraft or a model boat . . . You may even have such a motor waiting to be used! Do *not* run such a model indoors except on a wood or stone floor, or at least covered with lino. It is really better to perform outside on the patio, school playground or other smooth hard surface where fuel drips will pass unnoticed.

You will need a flywheel as well as the motor – just as you would with a boat motor. Your anchoring points and pan base of the car will have to be more robust than with an electric motor. Also important is the need for proper cooling when running. This can be achieved through a proper radiator grille at the front; by omitting windscreen glass in a saloon, or by an open cockpit in a racing car.


Elegant R/C powered model by Flight Link Control. This one has a transparent shell to show the working of controls, normally it would be appropriately painted. Wheels here are specially made for the company. Scale is about 1/8th.

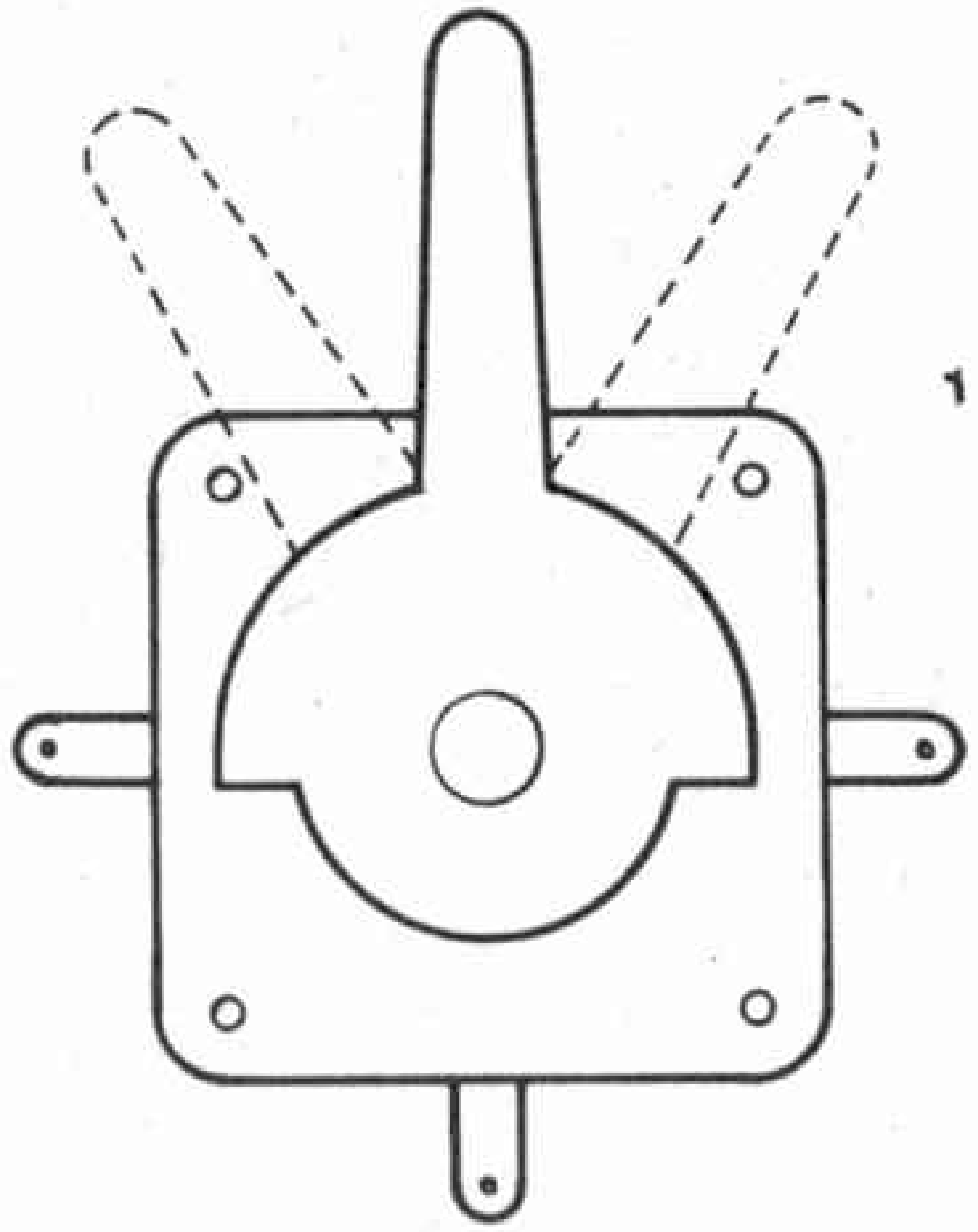

Shows how motor can be mounted by road wheel, and then can drive it by means of a sleeve on the drive shaft. Simple and practical.



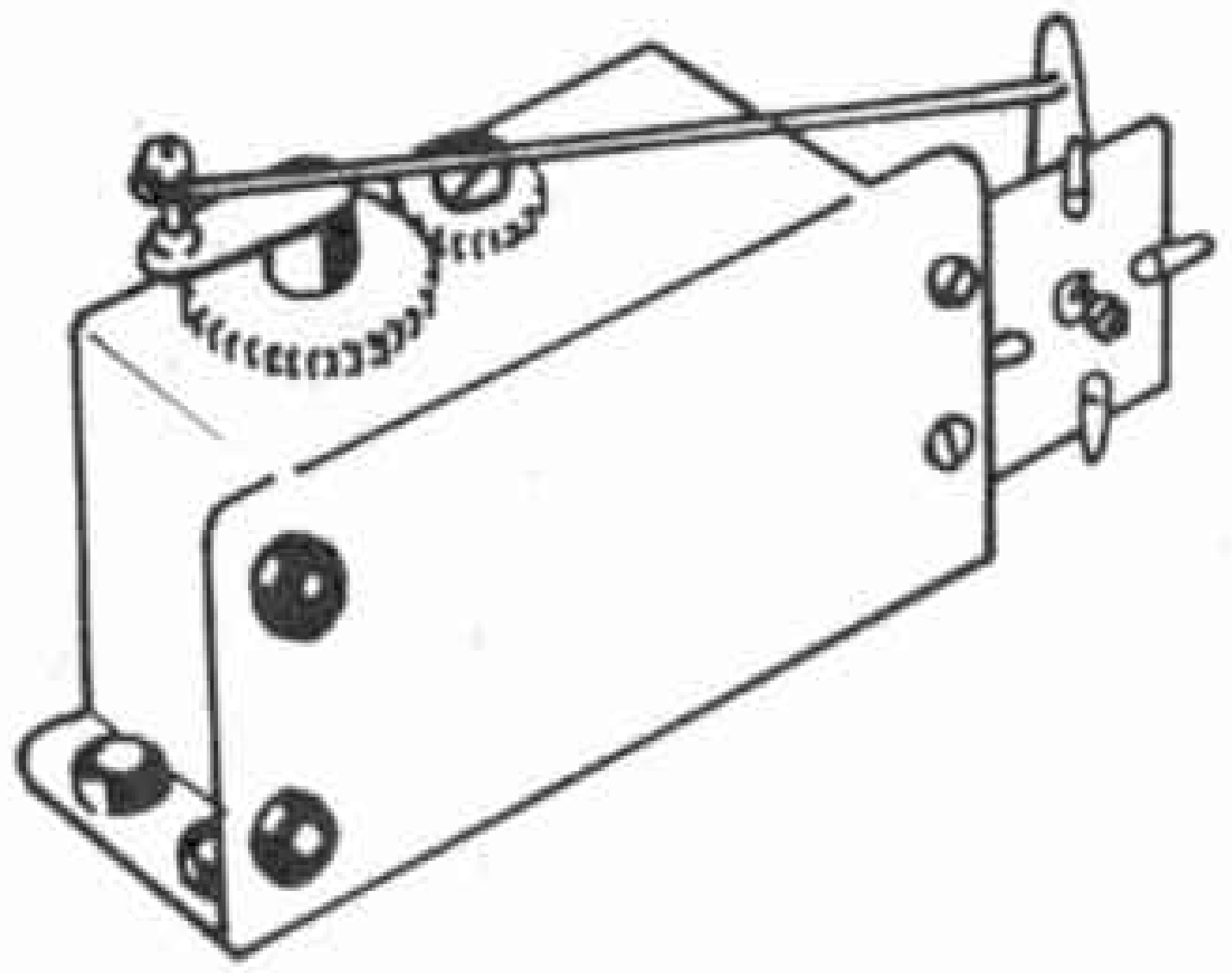
The Mainstream Ferrari shown with its simple transmitter beside it. Ready to run, the outfit in expanded polystyrene box costs only about £16. Range is limited – but no limit to the fun! Beatties of London have it in stock.

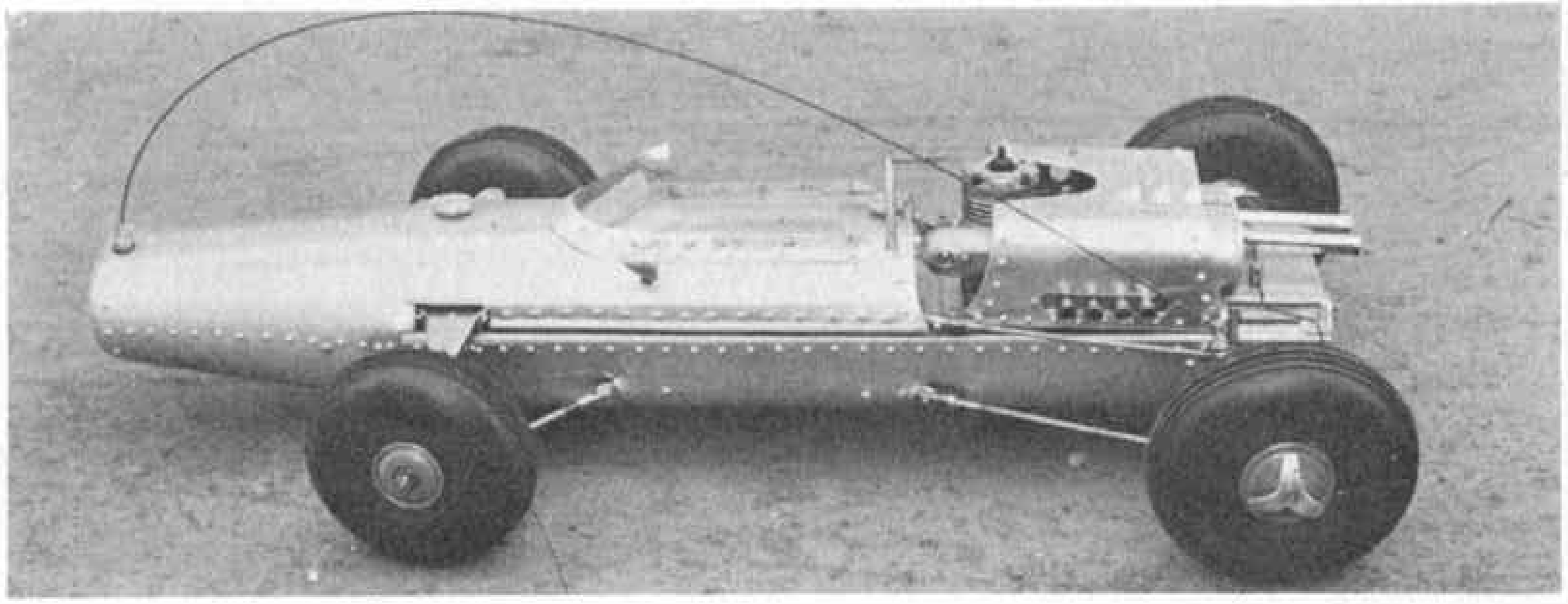
follow the contrate gear system, where a small crown wheel is fixed to the axle and a toothed gear to the motor shaft which will give a ratio of from 2½ to 4 to 1. Use of Meccano gears from their transport sets can also be advised, especially if you choose a fairly large scale to work in. With the space available it will also be possible to instl a motor to drive the road wheels via spur gears. This is good, since it is a simple gear chain, and there are fewer power losses by unwanted friction than will be inevitable with a crown wheel type of drive.

However, the reader will have noted that most of our pictures show cars with small diesel or glowplug motors installed. This is because they show more advanced models than we are, as yet, considering, but there is no reason whatsoever not to fit a small internal combustion engine, particularly if you already have some experience of operating en-



Switcher panel. Level can be pulled or pushed as per dotted lines, connecting circuits through to left or right. Below, it is shown fitted to a servo unit as compactly as possible. This provides three positions: upright (say straight ahead), left and right.



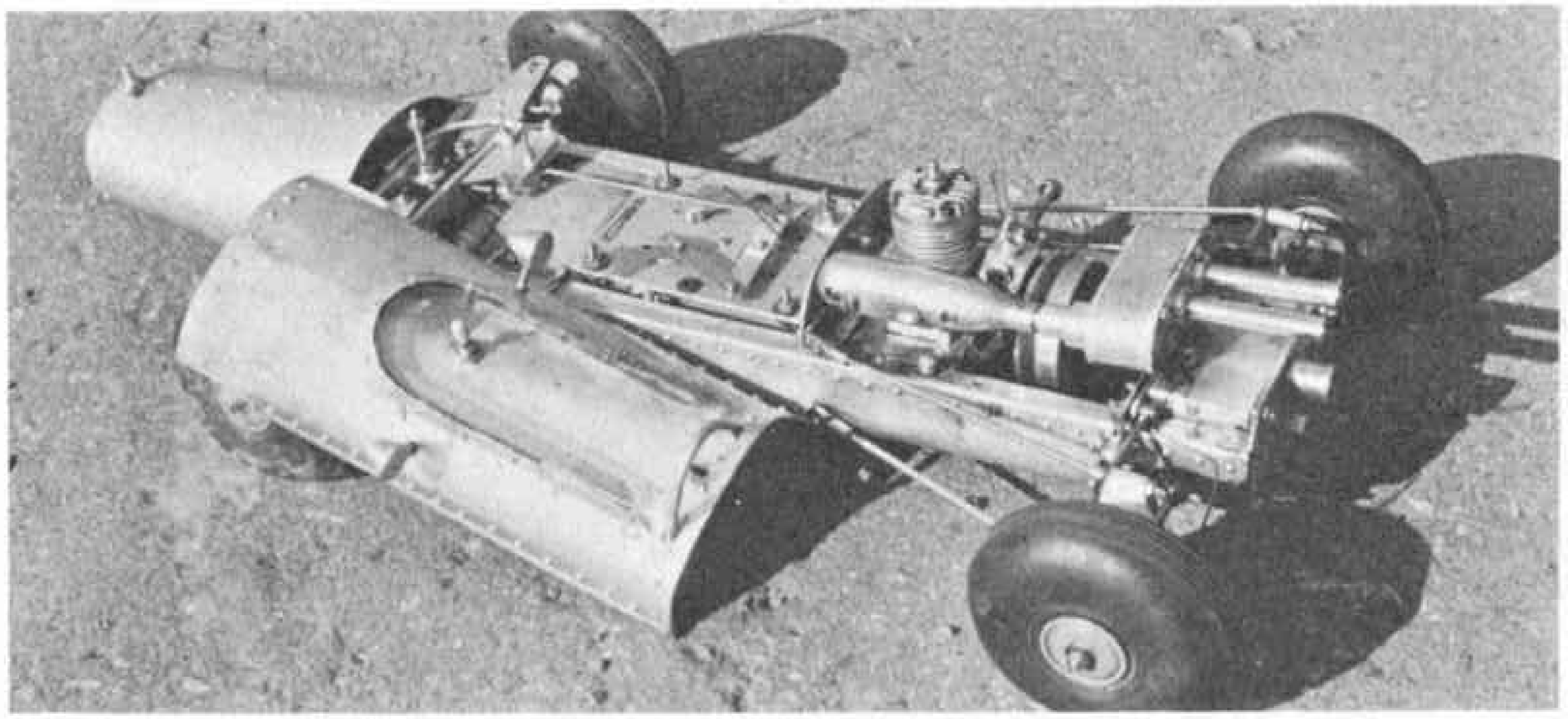


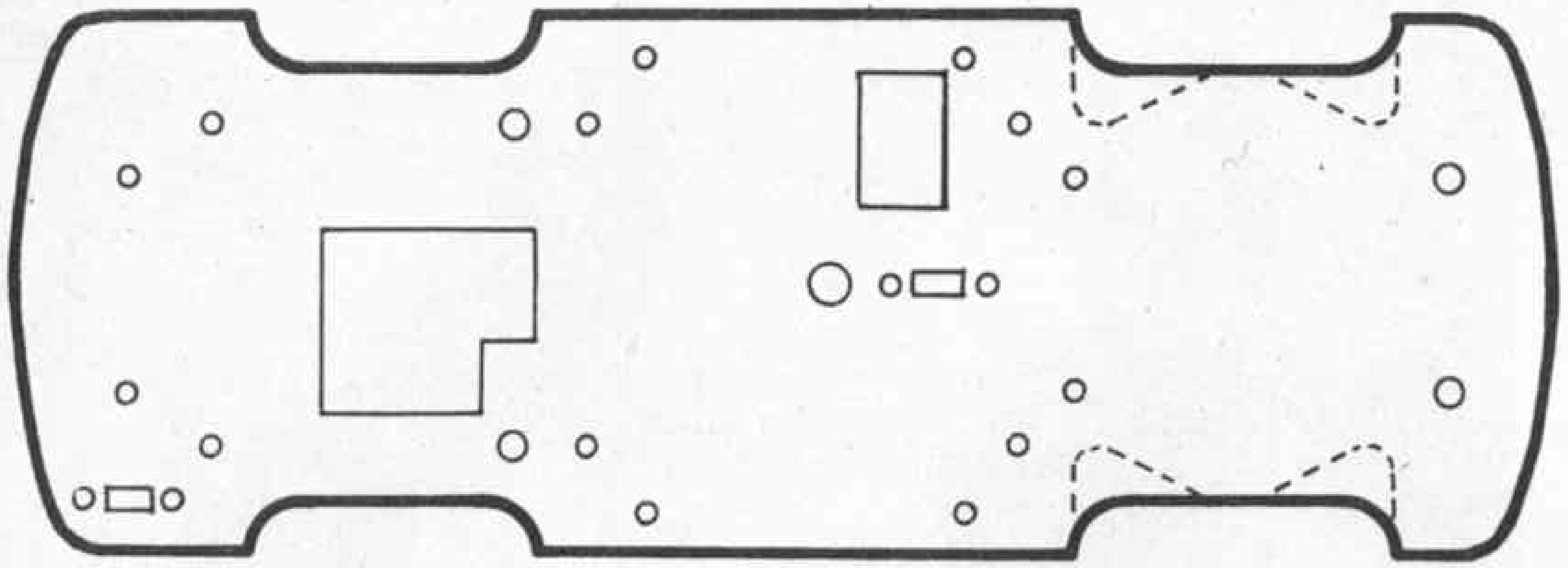
What can be done! A metal-bodied (rivets and all) car in 1/8th approx. scale with glow-engined power. This is for multi-channel.
The same car is shown below with centre panel removed.

a moderate number of kits available; it is really a question of shopping around and seeing what can be bought. Frog offer motorised car kits in 1/16th scale which include a Ford Cortina and a Morris 1100 which we have seen. We have not seen them about as much as we should have liked, but the price is reasonable at about £1. There are also one or two that Riko have imported in the Bandai range, though here these delightful motorised cars are a little more expensive at between £2 and £3.

The next practical size is 1/12th scale or one inch to the foot. Here the supply of kits from which parts could be used is limited in the main to rather delightfully detailed racing cars such as the Tamiya cars which, although truly to the 1/12th scale, nevertheless, being Grand Prix cars, do not offer much space to put the bits and pieces, nothing for example, to compare in space with a saloon car of a smaller scale. Some of the G.T. cars, however, meet the need admirably.

A thought arises here, we have now got to a good working size, and if we ignore the kit position, we can consider what it is possible to make with limited





Typical outline for a chassis pan. Dotted lines show cutaway to allow wheels to steer and act as stops. Other marks are fixing holes and location of gear.

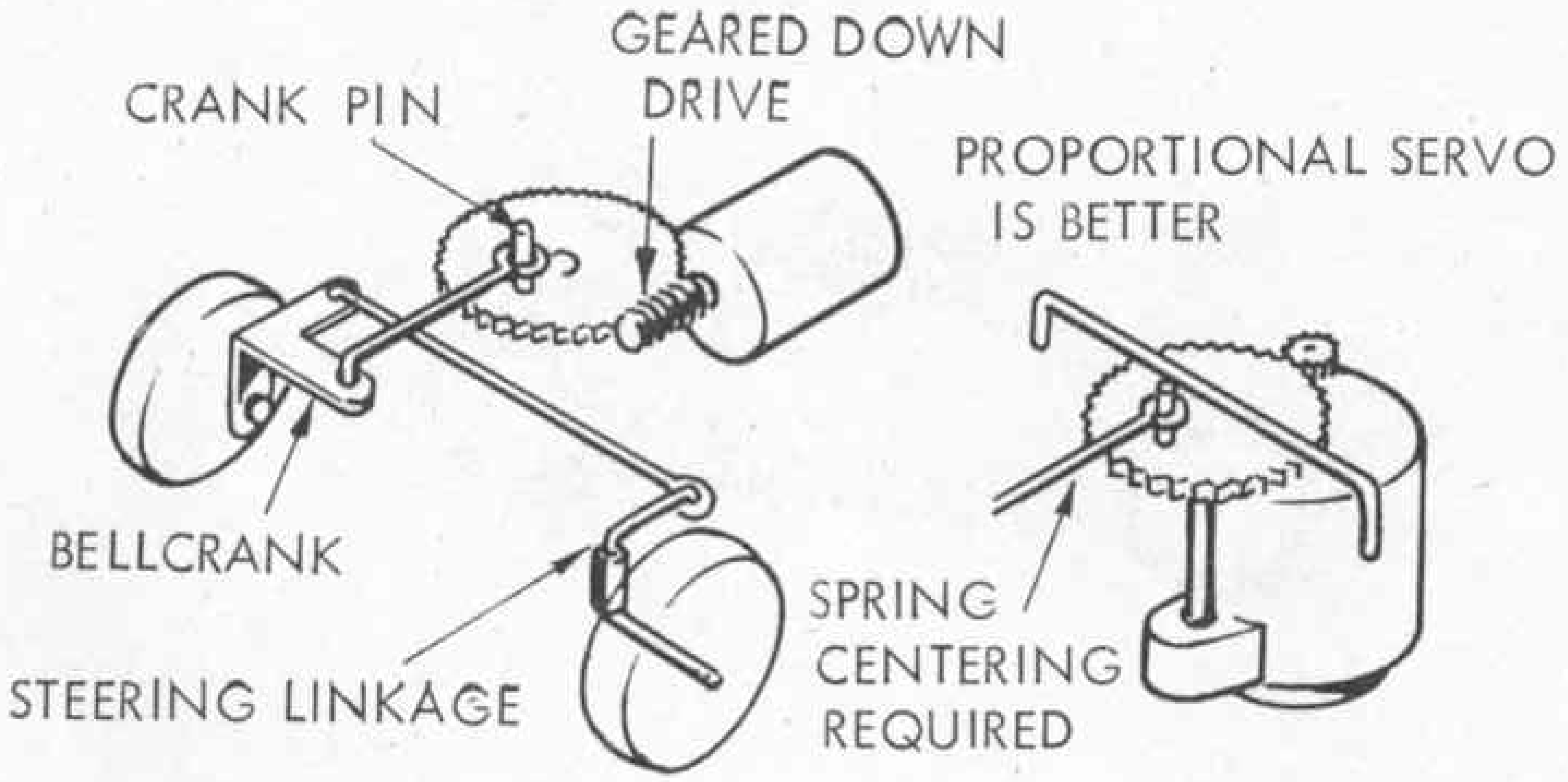
resources. No longer can we rely entirely upon kit parts and we must shop around for robust substitutes that we can use. In this connection the solid rubber wheels offered for model aircraft in their larger sizes present distinct possibilities.

BUILDING A SCRATCH CAR 1/12th SCALE

As a first project, we offer the reader a freelance car in what is approximately 1/12th scale using model aircraft wheels and following a design based freely on the popular wedge type of car which in various forms has been so successful in Grand Prix racing this year.

We have taken a wedge which enables a simple wood body and underpan to be constructed and have allied to this one of the fascinating airfoils which have been the subject of so much controversy in full-size circles during the year. It doesn't produce a car which is precisely like anything, but it does follow contemporary design and thought, and could be attractive. We are going to call it CA'CANNY, it is up to you what you call yours.

Interesting novelty model from Japan – a model Jeep which pulls trailer bearing a boat (itself R/C in turn!). It does serve to show yet another twist that can be given to a model project.



Some more suggestions by R. H. Warring for proportional steering. These come from his book mentioned above. Read also his Single Channel Radio Control *(Model & Allied Publications Ltd.)*.

earlier the whole steering unit can be adjusted to give a slight bias for left or right-hand circle if you feel this is going to be a help in free running of the car between signals.

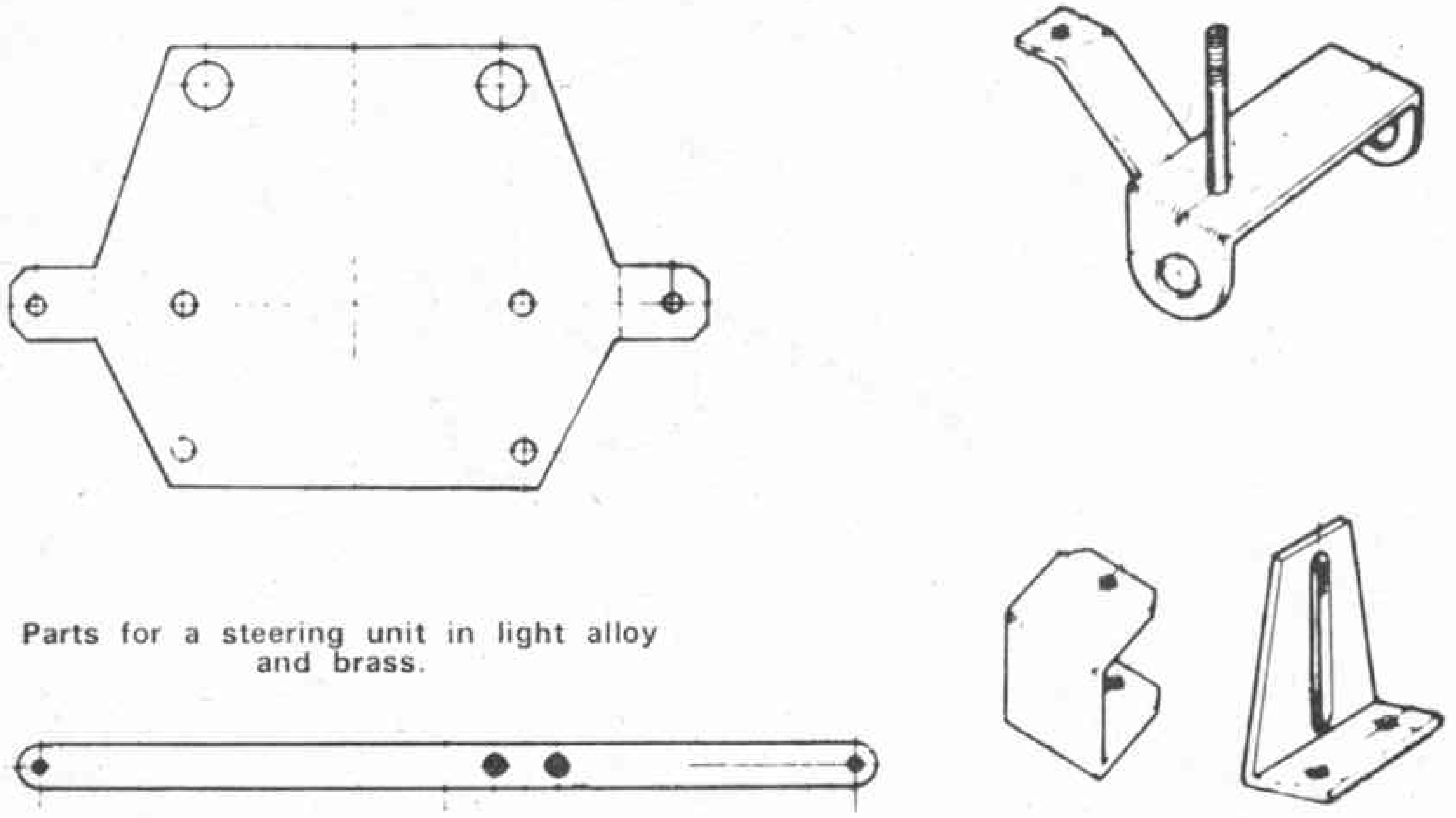
REFINEMENTS

We have considered so far only a car with a left, right or straight ahead arrangement operating by what the radio control people call 'bank bang'. This gives, as we have mentioned, a somewhat jerky effect, so that there may be a demand for a slow and precise steering arrangement, that is to say, a proportional movement. This can be done, but it has snags in that your signal will always wish to complete the whole sequence. You can, therefore, have the odd situation that if you are turning, say, to the right, and you have already made a right turn you will have to go through the whole business of a full left turn before the device comes back to the right! This is one of the problems which we have mentioned. We do feel that, at any rate, in the early stages of operating a car, the 'bang bang' operation is adequate.

HOW TO POWER YOUR MODEL

Nearly every beginner will be well advised to choose a simple electric motor to power his first model. It is simple, clean (no trouble with spills on the dining room carpet!) and introduces no particular skills beyond connecting up batery pack to give forward motion. Many of the little Japanese motors already mentioned for boat operation can be utilised here. The transfer of power from the motor to the road wheels of the car can be tackled in various ways.

The simplest of all is to slice a tight piece of rubber or neoprene tube over the motor shaft and let this rest against the tyre of the car. It will give a slow, steady speed, have nothing to go wrong and involve the least 'works'. Another motor can be fitted to press against the other road wheel – thus giving you the simplest twin-engined car ever. Those who have already had experience of slot car racing will wish to

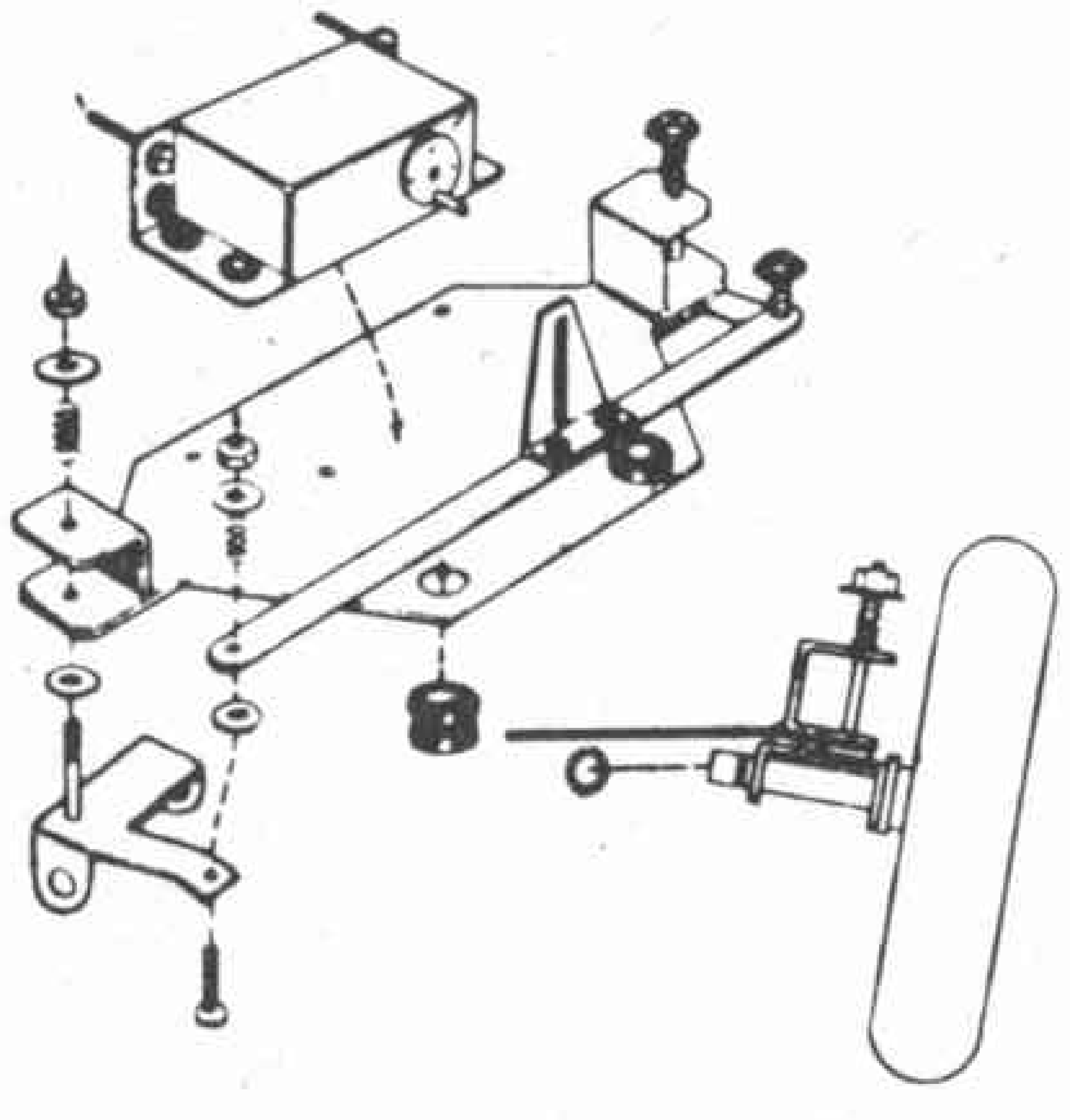


Parts for a steering unit in light alloy and brass.

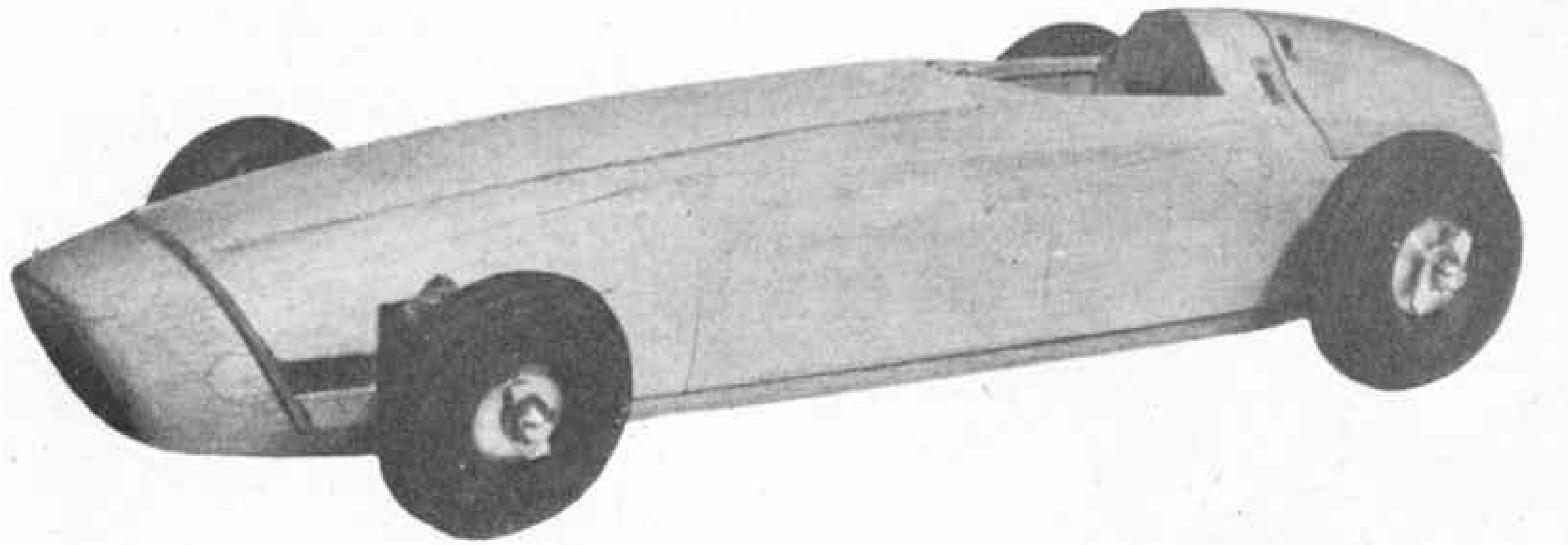
washer underneath which holds the metal washer away.

When it's soldered, you can pull away this little paper washer and so leave a little play in the wheel which should spin very freely.

Now if we place the stub axle in the holes which you will note are shown on the beams, it is firmly fixed in place once the top part of the beam is screwed down on the spacer. The little link which has been bent on to the other piece of the stub axle will fit onto the track rod and you will see it links up with the other wheel and the front axle assembly is very nearly finished. The whole unit bolts down on to the base plate or under pan of the car, and you are ready to instal the servo which will move the linkage at the centre. It is a good idea to arrange a self-centreing device which can be either a light spring or a couple of elastic bands. One or two alternative methods of making this steering assembly are also shown. You may be lucky enough to have some old bits of electric light fittings which serve for the parts we have bent up. If you have any useful Meccano pieces, they also can be pressed into service, provided the scale of the model you are building leaves room for them to be installed. As an added refinement we have mentioned



Parts shown above assembled. Note camber of wheel in full-size style.



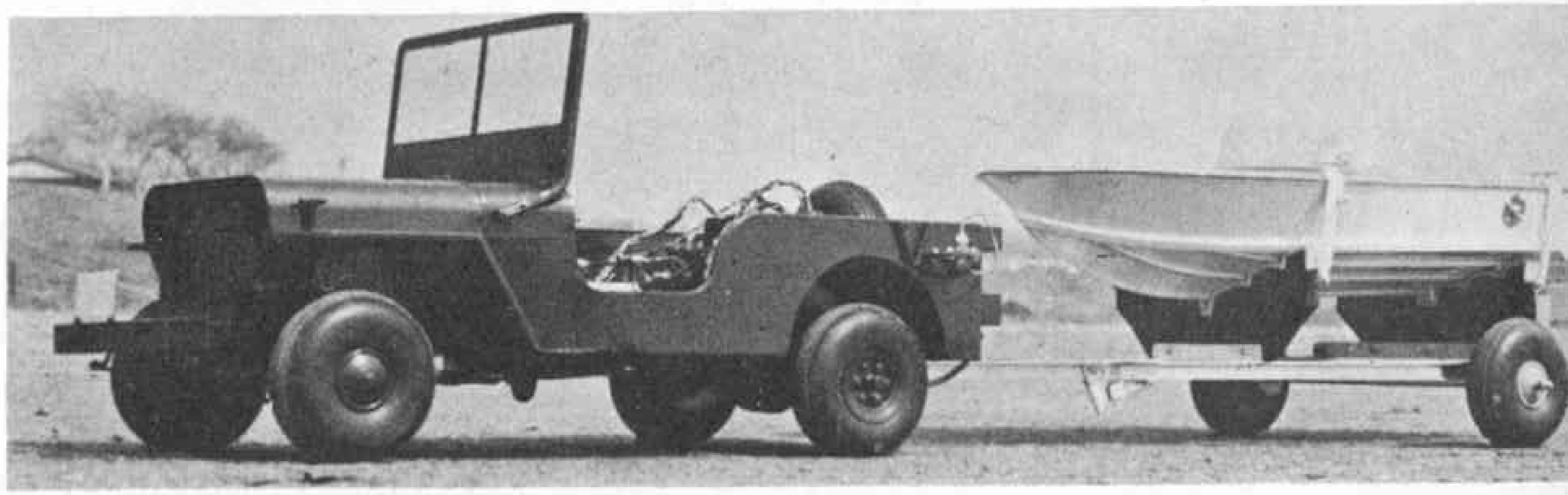
Balsa body and ex-aero wheels from Keilkraft and Graupner show how the job can be done from available supplies. This model was made by J. A. Hadley and appeared in *Model Cars*.

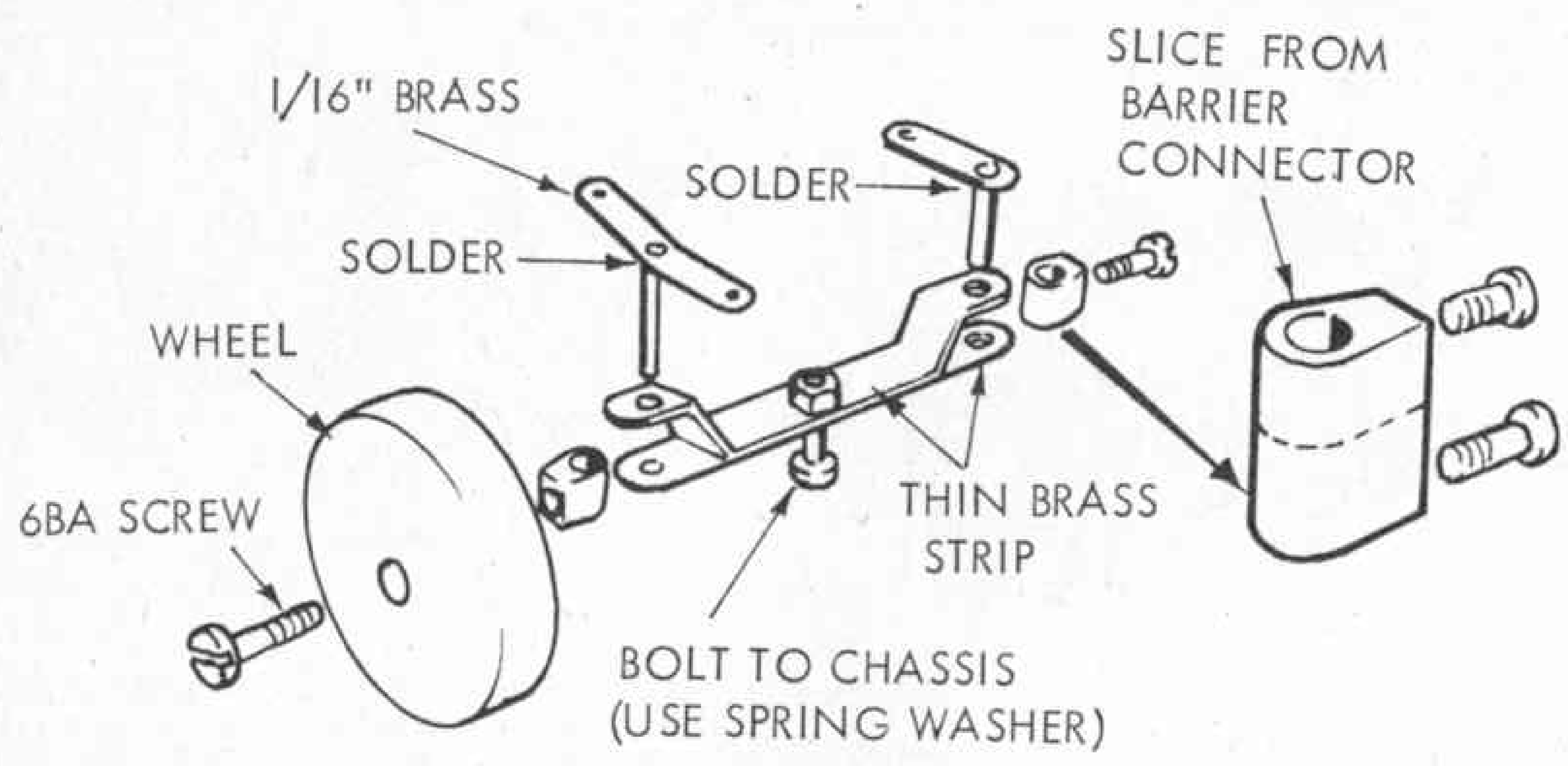
We are using two pairs of wheels of different sizes, because this is a quite usual thing in full-size circles. We have just over 2-inch diameter wheels for the two front wheels and about 2½ ins. for the rear wheels. We have decided on a 7 ft. 6 in. scale wheelbase which places the wheel centre 7½ inches apart in one inch to the foot scale, and we are going to have approximately 5 ft. track for the rear wheels, and 4 ft. track for the front wheels which gives them a position of 4 ins. apart and 5 ins. apart centre to centre, which now begins to establish the general shape of the car.

The bonnet will extend in front of the front axle and the tail will extend beyond the rear axle line, giving us an overall length of approximately 12 inches. If we allow an axle clearance for the underpan of 6 in., that means we can bring our bottom of the car to within ½ inch of the ground, which should give it a nice low ground-hugging appearance.

Let us therefore then, construct our body of ⅛ ply, or even a good hard balsa as the bottom of the pan; the body itself is constructed of either balsa or light ply, or could even be of card. Details of this construction will be given in the final instalment.

At this stage, having arrived at a basic car shape and size, we will go over now to consider some of the mechanical elements of such a model. The previous




1/16" BRASS
SOLDER
SOLDER
SLICE FROM BARRIER CONNECTOR
WHEEL
6BA SCREW
THIN BRASS STRIP
BOLT TO CHASSIS (USE SPRING WASHER)

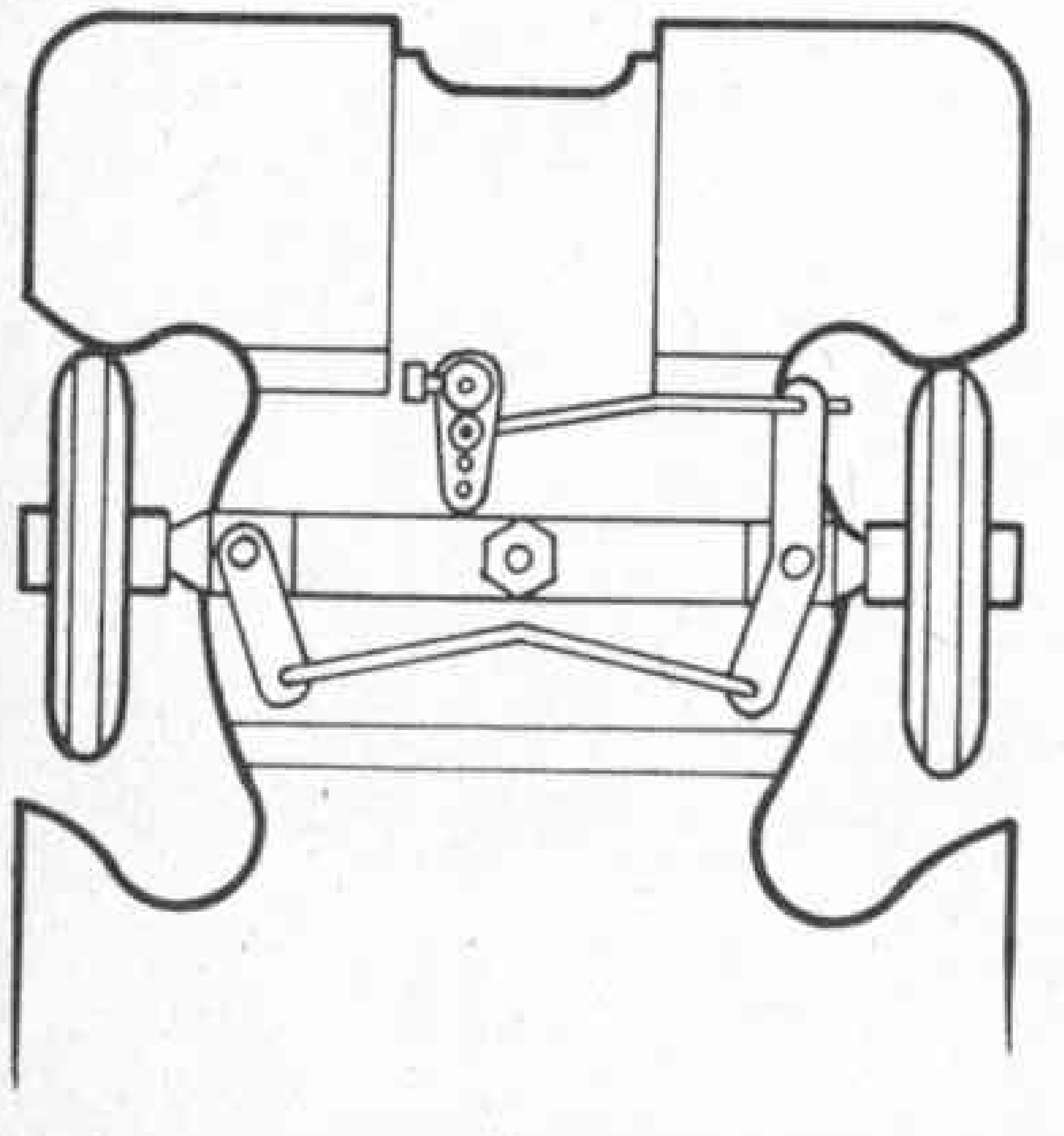
Simple steering layout from brass strip. Meccano parts could also be used. From a plastic bus R/C installed by D. Bollen.

instalments of this series have dealt with the radio and electronic problems encountered in single channel operations so that it should not be necessary for us to recapitulate, we prefer to devote time and space to mechanical aspects of a land vehicle which have not previously been covered in the series, or indeed, to any extent in any contemporary literature.

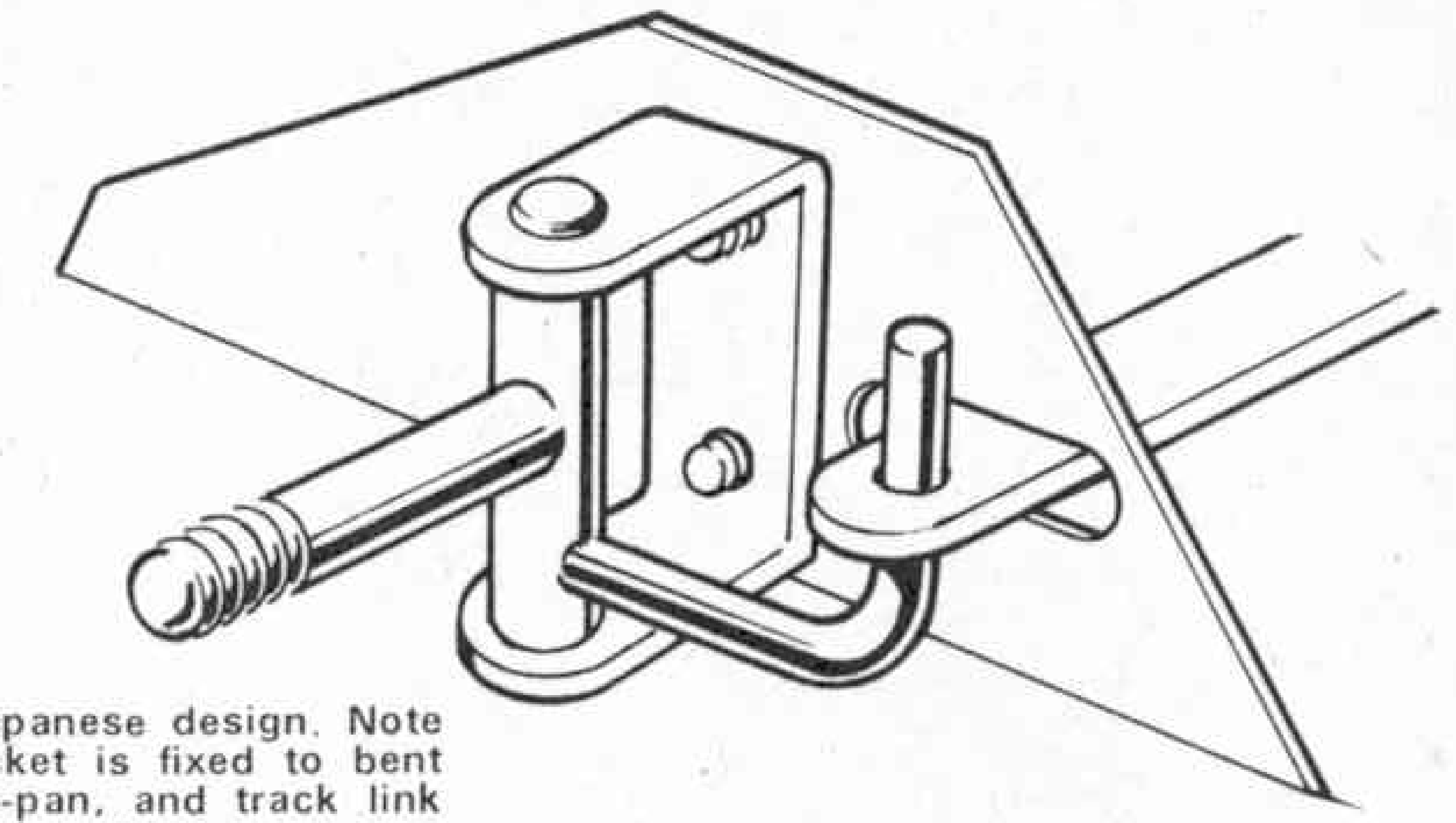
STEERING A MODEL CAR

The obvious way to steer a model car is with the front wheels turning just as in a full-size car, to the left or to the right, or straight ahead, according to what is required of the vehicle. This is normally referred to as Ackerman steering and a diagram shows how it should be ideally arranged. In a small model like this we needn't really worry over the finer points of such a design, such as toe-in and the exact angle at which the king pin goes, but just a general basic notion.

With single channel radio we must remember we haven't a lot of controls, so it would be a good thing to have our steering so arranged that it will normally go straight ahead if no signal is given. We can have an adjustment to angle the steering so that it can either go straight or it can go nearly straight ahead, that is to say, making a very large circle. Such an arrangement would be suitable for operating a car say, on a school playground or a tennis court. This adjustment



The same steering mechanism in place. Cranking the tie-rod and link adjusts for true running. Note how cutaway acts as limit stop for steering turn.



Steering from a Japanese design. Note how kingpost bracket is fixed to bent up part of chassis-pan, and track link comes through a slot which acts as a limit stop.

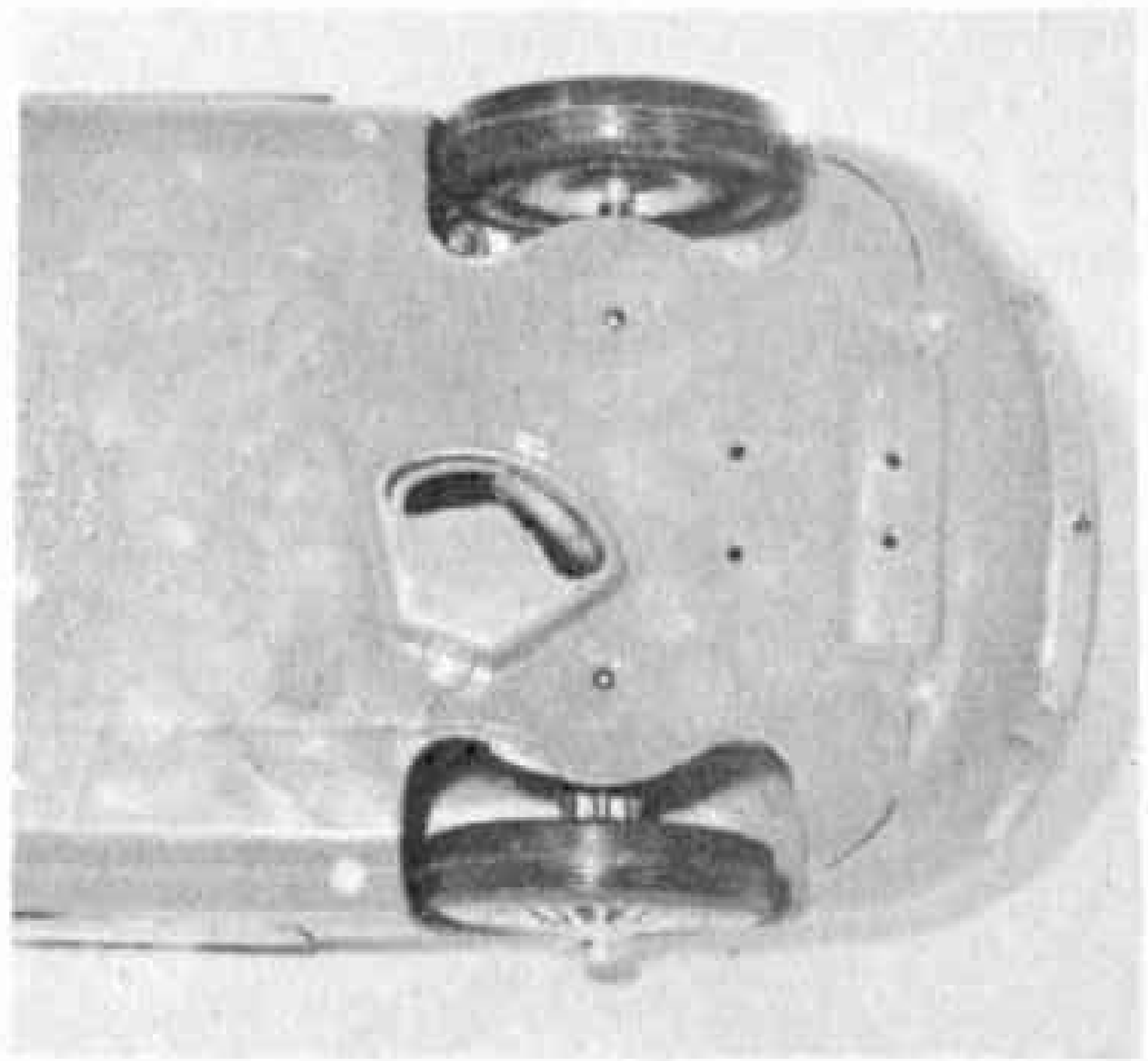
solder over your soldering iron head so that you have coated the head of your iron with a coating of thin solder. Dip the soldering iron in the fluxite again and bring the solder stick and your iron together where you are going to join, and you will find it will melt into a very nice blob and will run into all the areas where you have the flux, which helps to make it flow.

This first effort will probably be very ugly and blobby, but if you leave it for a few minutes until it gets cold and tug at it you will find you have a secure joint. When you are more skilled, you will be able to use the iron on the solder to make it flow just as you wish, and produce a beautiful smooth finish but this is for your more expert days. If you are already good at soldering, you can ignore this beginner's guide.

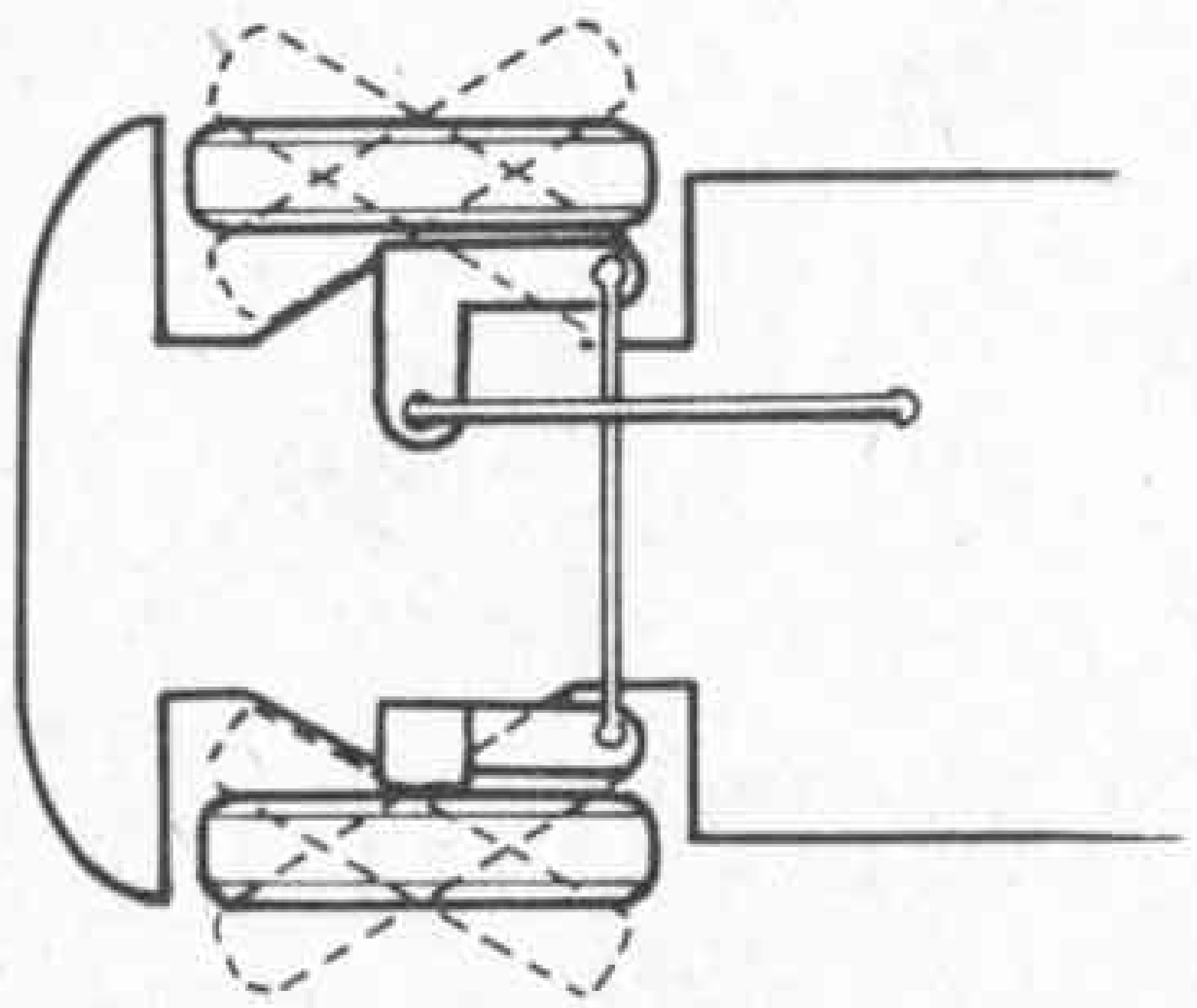
For neatness, a little round washer soldered on additionally to the stub axle makes a fine resting place for the wheel to butt against, but this again is a matter of refinement.

It is shown in the drawing as done, but if you don't want to do it, then it's up to you. Similarly, if you haven't got a washer and you want to stand the wheel off away from the stub axle, then a short length of brass tubing which you have cut with a file or a fine saw will do the job just as well.

Now comes the problem of keeping the front wheel on the stub axle. The stub axle itself should go through the hole in the wheel hub and protrude ideally not more than ⅛ in. A little washer is soldered on the very end. So that you leave the wheel still free to run, you should have a little thin paper or thin card



Underneath the Mainstream Ferrari. Jockey wheel swings back and forth to provide steering in reverse position – otherwise in forward motion the car goes straight ahead. Wheels do not actually touch the ground appreciably.

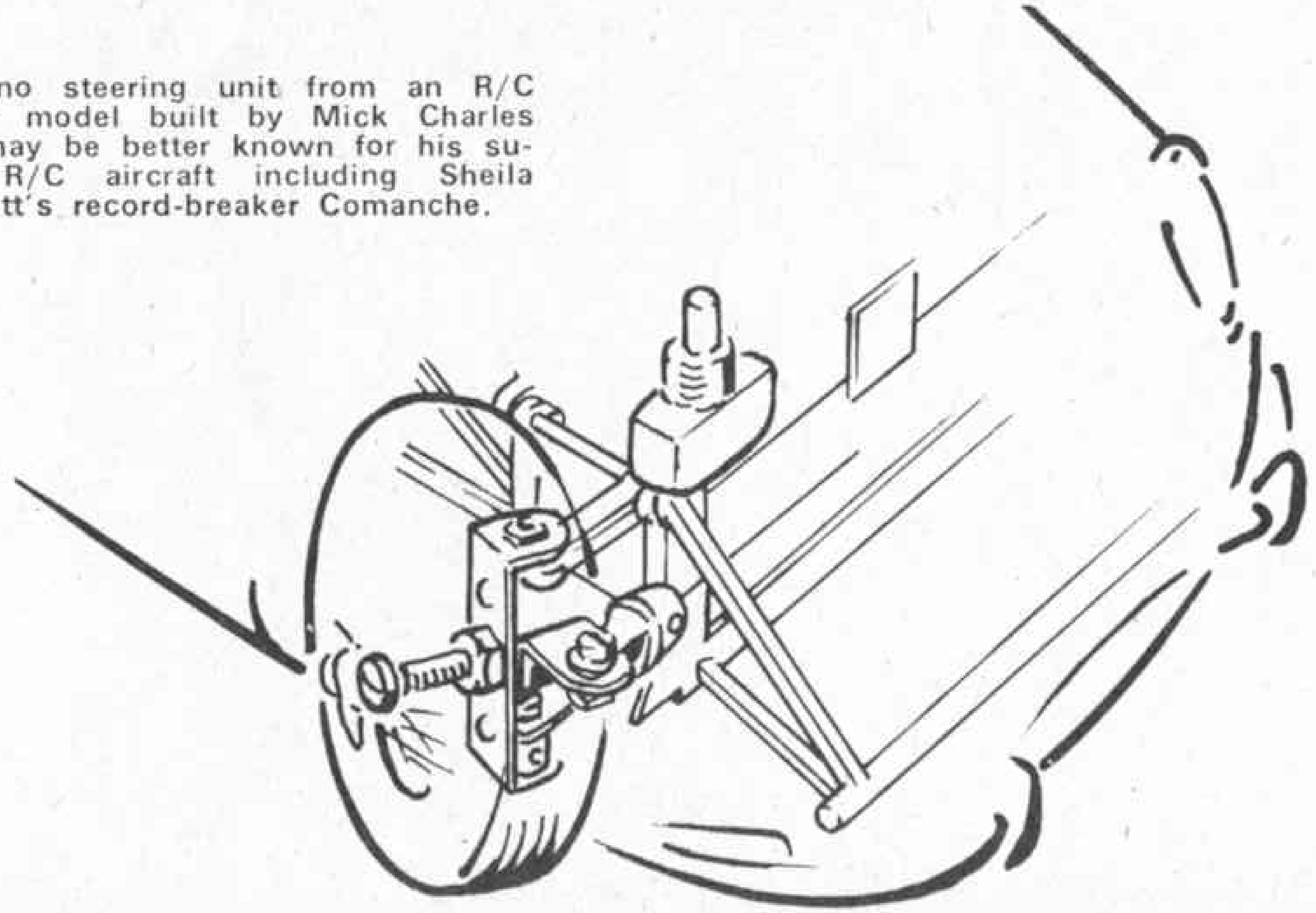


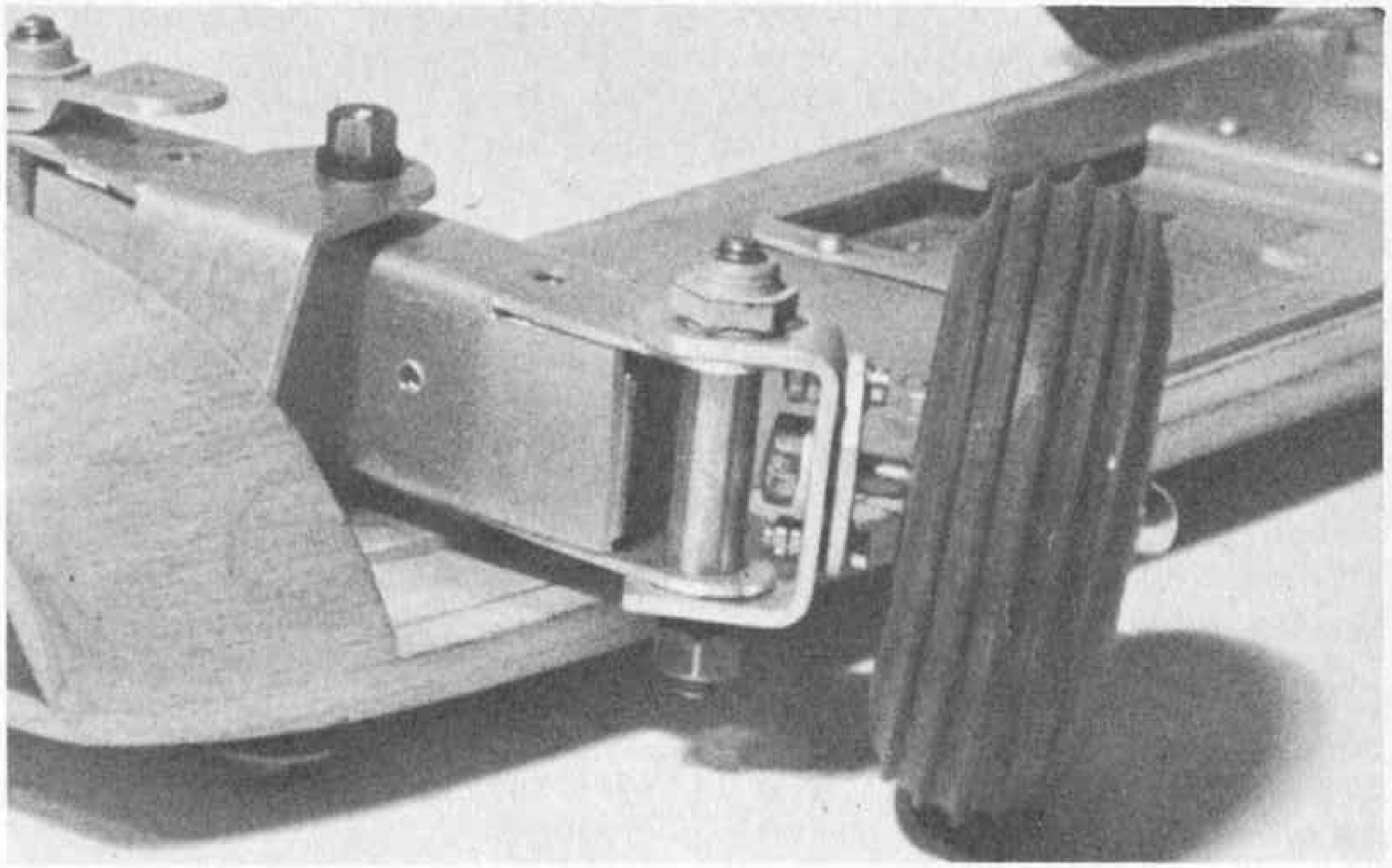
A very simple steering layout – probably the simplest possible. From R. H. Warring's book 'Radio Control Models' *(Museum Press)*.

wire. There is no need to be nervous about the soldering aspect. If you have bound the two pieces together as shown and put them in their little jigs, quite a rudimentary piece of soldering using any old soldering iron to hand will be adequate for holding the pieces together. If you don't do it very expertly it won't look so neat but will probably be quite strong enough.

If you have not done any soldering before, here is the way to do it. First, make certain with a piece of emery paper or glass paper, that you have the pieces to be soldered as clean as possible. The wire which you bind round will itself be shiny and bright so that it need not be cleaned any more than it is. Now get some Fluxite (which you get in a little tin – it's a brown material, rather like dripping), smear a little of this on where you are going to solder and then heat up your soldering iron, which in the case of an electric soldering iron merely means switching it on. As soon as you put the iron in contact with the flux and you hear a hiss and a bubble, you know it's about the right heat. If you use the kind of solder which has the flux already combined with it, you could do without the special flux as an addition. We usually use both to make quite certain. You rub this

Meccano steering unit from an R/C Jaguar model built by Mick Charles who may be better known for his superb R/C aircraft including Sheila Scott's record-breaker Comanche.

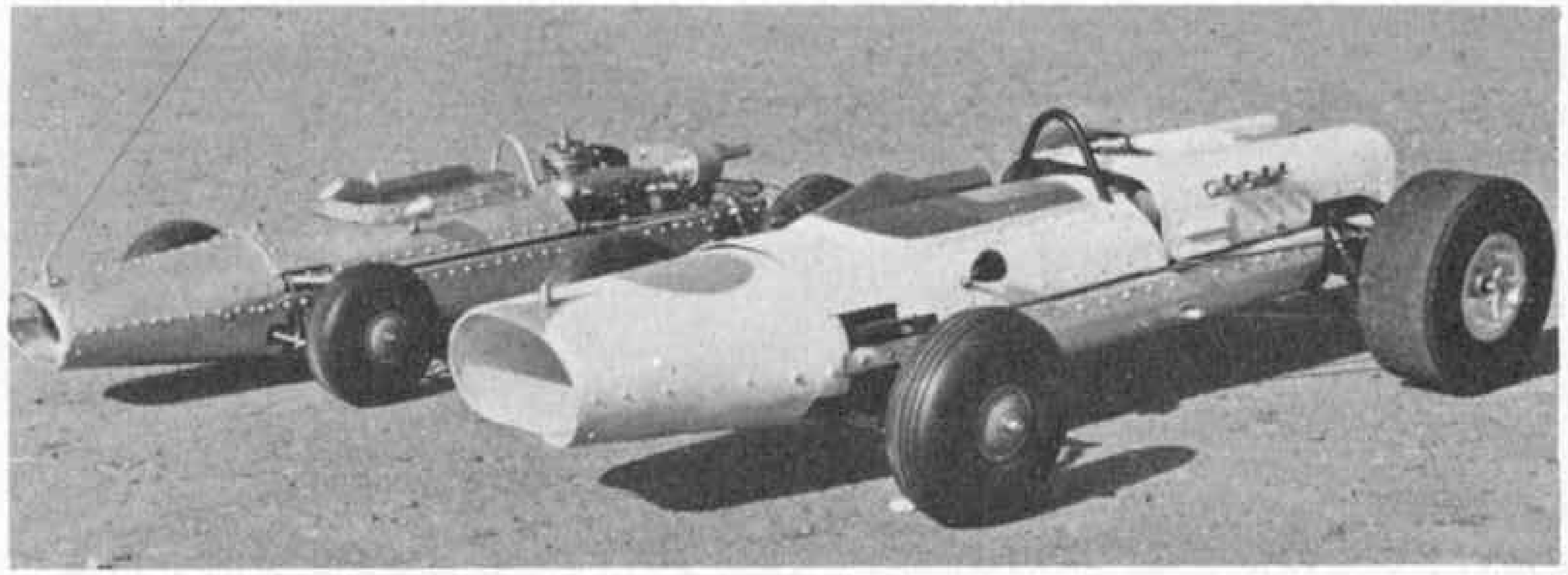




This shows the neat steering arrangement on J. A. Hadley's F/1 racer. Use of standard nuts and long bolts saves a great deal of more difficult work.

should be capable of alteration on the actual car before the day's work starts, but need not be changeable during running. You then have a car which has a bias to a left hand circle or a right hand circle when left alone, but a big circle which, to some extent, could be regarded as straight ahead.

We can now link up our steering unit to a servo so that it will give a left or right turn. This will be a positive left or a positive right, rather than a gradual and proportional turn such as you would give in a full-size car. This may give a rather jerky motion to the car and we will consider later if there are alternative and better methods. Generally when we achieve a better method in a gradual turn, we may find we have sacrificed some other advantage, so as in all simple models, it continues to be a



Metal-bodied car shown earlier with running mate in foreground. Cars like these can be obtained in this country – but are for more sophisticated equipment.

matter of compromise, we don't get the ideal arrangement with simplicity, but we get the best of a choice of different degrees of perfection.

Before we go more thoroughly into this, we should consider other alternatives in the way of simplicity. Some cars we have seen have been permanently offset for a small left- or right-hand circle and can be made to go straight ahead or to the opposite lock by a signal, and then revert to their previous position.

Another method is really a development of tank or half-track steering where, by reason of having a motor driving each driving wheel separately, if you stop one and leave the other running, you will tend then to go in a turn, using the stopped motor as the centre of the circle and for the running motor to bring you round the stopped item. For a tank or Bren-gun carrier where the half-track itself ceases to go forward, this gives you a skid turn. The same sort of skid turn is given by an auto cross, and trials drivers by what is known as the fiddle brake; it is not an ideal arrangement but can be quite effective.

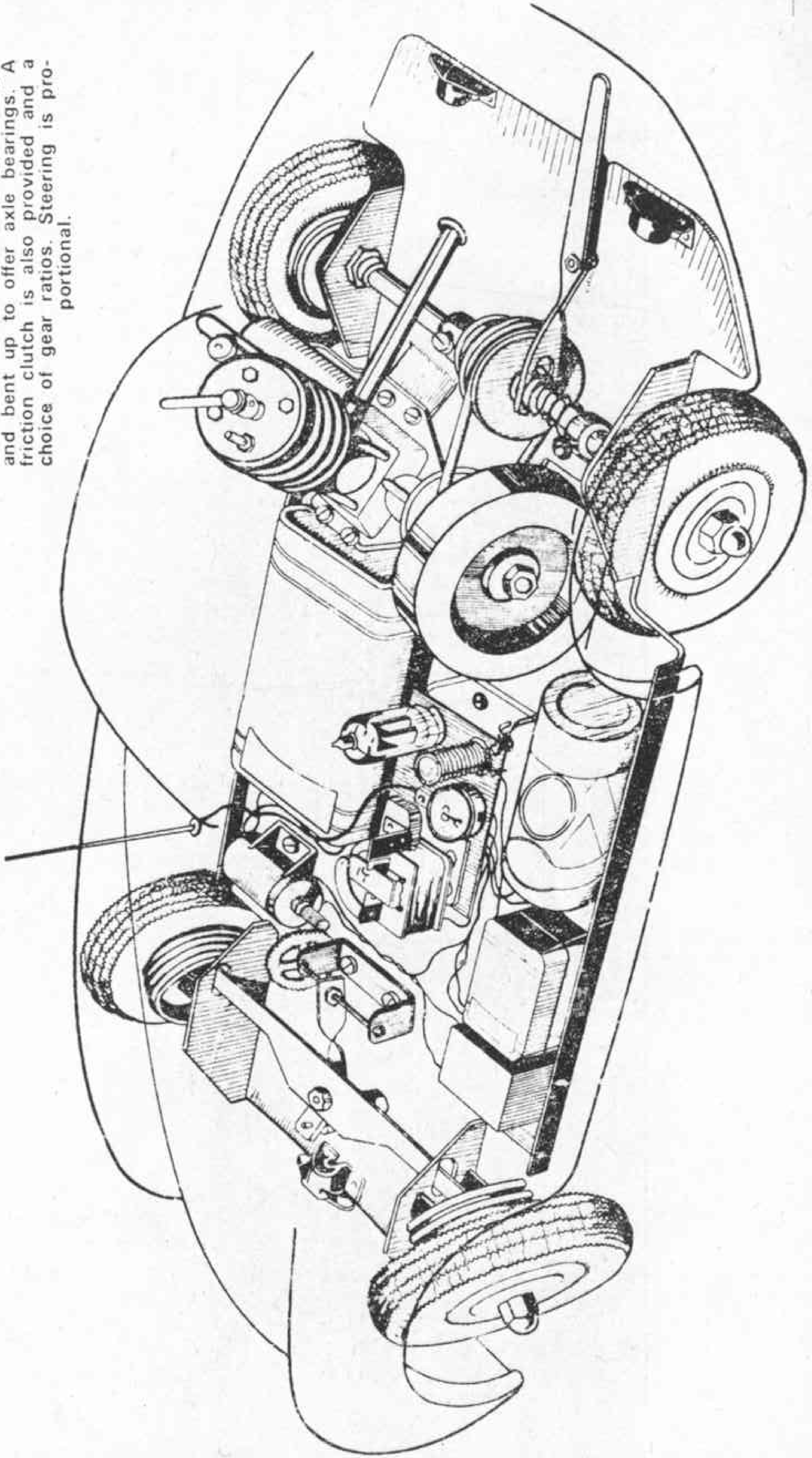
Another way that we have seen in a commercial radio control car project is to have an additional wheel concealed under the car, a kind of jockey wheel, on which the front end of the car rests, so that the two apparent steering moving wheels on the front do not, in fact, revolve but the whole thing goes on the front jockey wheel or gimbal wheel,

ELEMENTS OF STEERING GEAR

Whether you make up a car from scratch or whether you make use of a plastic kit, it will be necessary to make the steering gear up and discard the plastic steering pieces that you have got in the kit – they may be useful to you in helping you to decide the actual shape of the units of the steering gear, but are not robust enough for hard use.

The steering unit will comprise some sort of a beam which supports at each end what is known as a kingpost, and this kingpost is the part that swivels with the wheels. Attached to the kingposts are short stub-axles to which the front wheels are fitted. The kingposts will again be linked together with a track rod so that they must move in unison.

We need a device to connect up this track rod with our servo to give us the left and right turn. This takes the form of a further link in the centre of the track rod. The simplest way of building up the kingpost and the stub axle is with twisted wire which is then bound together with thin florist's wire or fuse wire and soldered. Simple brass cutout pieces can also be filed up. Since it is desirable that the left and the right hand bends are exactly the same insofar as left and right angles are concerned, a small jig should be built up. This can be done with panel pins nailed into any piece of scrap wood and will be used on next month's model. The sort of wire to use is either aeromodellers' piano wire which you can buy from your model shop in suitable thickness, or we can use bicycle spokes instead. However, as long as it is a stout wire, it doesn't really matter, in fact, in this very small size you could even use brass



Cutaway sketch of Mercedes-Benz model powered by small diesel motor. This has long been a popular design abroad (it even shows a valve receiver!) but is the finest basis for a modern model. Pan is of metal – light alloy – and bent up to offer axle bearings. A friction clutch is also provided and a choice of gear ratios. Steering is proportional.